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NATURAL HISTORY

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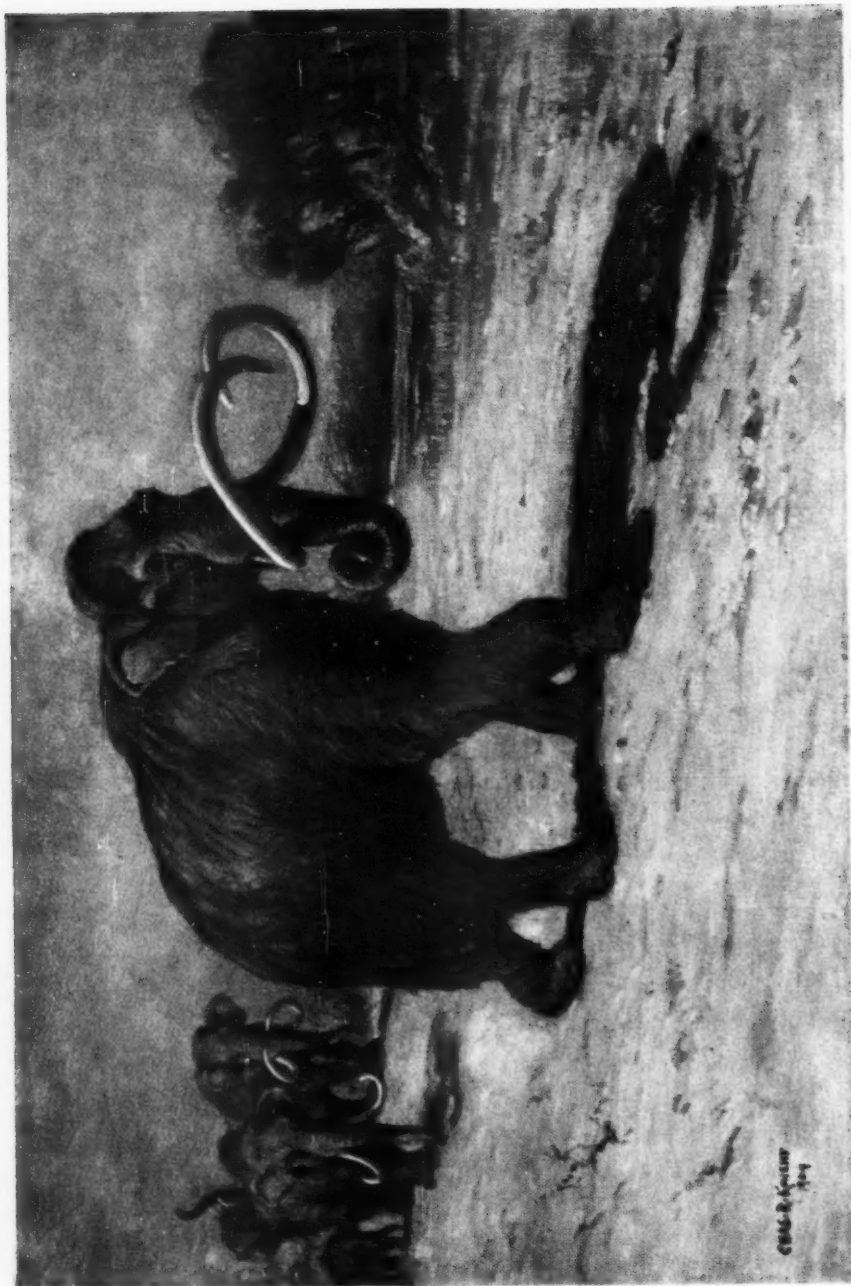
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THE JEFFERSONIAN MAMMOTH OF INDIANA (*PALELEPHAS JEFFERSONII*)
After restoration by Oshorn and Knight; $\frac{1}{50}$ natural size

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Group of American mastodons (*Mastodon americanus*) along the banks of the Ohio River, where these animals were first discovered in 1739. After restoration by Osborn and Knight

The Elephants and Mastodons Arrive in America

BY HENRY FAIRFIELD OSBORN

President of the American Museum of Natural History

FOREWORD.—Among the treasures of the American Museum is the unrivaled collection of skeletons and skulls of fossil proboscideans from Africa, the home of the race, from Asia, and from North and South America. Aided by the Morgan and Jesup funds, a large volume is being prepared describing the whole history of the elephant and mastodont families as far as known today. The present article is a sketch of these remarkable animals as they migrated, one race after another, into America, became naturalized and acclimated, enjoyed their lives here, and finally became extinct, the last survivor being the great mastodon of the eastern forests of North America.

THERE are few joys in life comparable with that which the naturalist experiences when one of his predictions or prophecies happens to be fulfilled. In 1900 I predicted that Africa would prove to be the cradle of the Proboscidea; in 1903 this prophecy was verified by British explorers in Egypt. Naturally eager to visit the scene of this discovery at once, I refrained until my British friends had fully described and published this and other discoveries and gained the world-wide reputation therefor to which they were richly entitled. I then asked President Theodore Roosevelt for an introduction to Lord Cromer, at the time Viceroy of Egypt, and through the generosity of President Jesup of the American Museum an expedition was fitted out, carrying as credentials a thoroughly

characteristic note from President Roosevelt to Lord Cromer. Unfortunately, I did not keep a copy of the note but, so far as I recall, it ran as follows:

January, 1907.

Dear Lord Cromer:

The bearer, Henry Fairfield Osborn, is a friend of mine keenly interested in palaeontology who desires to enter the Fayûm district of Egypt. Any help which you may be able to extend to him or to his party will be greatly appreciated by

Yours sincerely,

THEODORE ROOSEVELT.

This brief and simple diplomatic message opened the doors of Egypt to the American Museum party. On our arrival at Shepheard's Hotel on the morning of January 23, a card was sent up announcing Captain H. G. Lyons, then director of the Geological Survey of Egypt, who thereupon as-

sured me that all the resources of the Survey would be placed at our disposal,—a camel caravan, a supply of the absolutely essential *fantasses* for carrying water, and, best of all, the guidance of a most intelligent and delightful member of the Survey staff, Mr. Hartley T. Ferrar. A personal caravan was also engaged. Thus, sixty camels strong, we wound our way past the pyramids of the eastern side of the Nile, skirted the fertile basin of the Fayûm, and struck southwest into the waterless desert until we reached the region that represented the ancient cradle of the elephant family. We at once set to work with a very superior force of Egyptian excavators from Kuft, under the direction of Mr. Walter Granger and Mr. George Olsen, two of the best fossil hunters of America, who stuck to their arduous post for nearly two months, until driven out by sandstorms and excessive heat. With their skilled aid, we soon discovered the burial sites of three of the early elephant dynasties; the *MÆRITHERIUM*, the abundant *PHIOMIA*, and finally the rare *PALÆOMASTODON*. The last-mentioned name is derived from the uncorrupted Greek words *παλαιός*, *μαστός*, and *ὀδόν*, signifying “the ancient nipple tooth.” This name, applied by the able British palæontologist, Charles W. Andrews, recently deceased, has proved to be of literal significance, because we now have reason to believe that *Palæomastodon* may be the direct lineal ancestor of our true American mastodon (*Mastodon americanus*). Thus for the American Museum was disinterred a superb collection of small ancestral mastodonts, remote and humble relatives of three branches of the mastodont family—all of Upper

Oligocene time, estimated by some geologists as 3,000,000 years ago.

The Fayûm Expedition took place seventeen years ago. It aroused in the writer's mind the liveliest interest in these relatively small and primitive proboscideans, and a desire to compare them closely with the large proboscideans of France and South America, which were first described in 1806 by the famous Cuvier, also the wish to compare them with the proboscideans described and figured by the British explorers Falconer and Cautley in India between the years 1845 and 1847, and finally the hope to trace all these animals from their ancestral homes in Africa and Eurasia through their migrations to America.

TRAVELING INSTINCTS OF THE PROBOSCIDEANS

An insatiable *Wanderlust* has always possessed the souls of elephants as it has those of the tribes and races of man. Not only to overcome the changes and chances of this mortal life, but also to gratify their intelligent curiosity ever to explore afresh forests, pastures, fields, rivers, and streams, they have gone to the very ends of the earth and have far surpassed man in adapting their clothing and teeth to all possible conditions of life. Thus the romances of elephant migration and conquest are second only to the romances of human migration and conquest. Variety is the spice of elephant life, as it is of human life, and the very longing for a change of scene and of diet has been the indirect cause of what in scientific parlance we term *adaptive radiation*—the reaching out in every direction for every kind of food, every kind of habitat, in itself the *cause* of radiating or divergent evolution and adaptation. It is to this predisposition to local, conti-

mental or insular, and world-wide wanderings that we attribute the many branches and sub-branches which have been developed in this remarkable fami-

ly. We may first enumerate all these branches and then signalize those that found their way to America and which form the chief subject of this article.

PROBOSCIDEA

Races I-X of the Mastodont Family: Mastodontidæ

I. THE MÆRITHERES, named from Lake Mæris of the Greeks. Small amphibious mastodonts of the North African rivers and lakes. See figure p. 9.¹

II. THE DINOTHERES, implying proboscideans of terrifying size. Existed in Europe and Asia in Miocene and early Pliocene times.

III. THE TRUE MASTODONS, arising from *Palæomastodon* of the Egyptian Oligocene. Sparsely represented in the forest and lignitic deposits of Europe; first appearing in America in Upper Miocene time, becoming the giant mastodonts of the American forests at the close of the Ice Age. See figure p. 12.

IV. THE YOKE-TOOTHED MASTODONTS, OR ZYGLOPHODONTS. First known in the Miocene of Europe and leading into Borson's mastodon of the Upper Pliocene forests of Europe and Asia, close to the true mastodonts.

V. THE LONG-JAWED MASTODONTS, OR LONGIROSTRINES, springing from the long-jawed *Phiomia* of the Egyptian Oligocene and becoming the *Trilophodon* of Europe, migrating through Europe and Asia in the Miocene and spreading over Nebraska, Kansas, South Dakota, and Colorado in Pliocene time. See figures pp. 10 and 11.

VI. THE TETRALOPHODONTS, the name referring to the four ridge crests on the anterior molar teeth. First known from the Lower Pliocene of Eppelsheim, Germany, and of Pikermi, Greece; migrated across India, and entered America in late Pliocene time during the beginning of the Ice Age.

VII. THE SERRIDENTINES, named in allusion to the serrations on the outer and inner borders of the grinding teeth; medium-jawed. First known in the Miocene forest deposits of Europe; migrated to our southern states, Texas and Florida, and survived to the very close of Pliocene time. See figure p. 13.

VIII. THE BEAK-JAWED MASTODONTS, OR RHYNCHOSTRINES, readily distinguished by the downward curvature of the tusks, similar to that in the Dinotheres. Of unknown European origin; first discovered in Colorado and California, and traced down into Mexico.

IX. THE NOTOROSTRINES, name signifying 'mastodonts of the south' because the animals are found chiefly in California and South America. Short-jawed, like the true mastodonts.

X. EXTREMELY SHORT-JAWED MASTODONTS, OR BREVIROSTRINES. First known species, the straight-tusked mastodont of Auvergne, Pliocene of France. The Brevirostrines migrated to India, reached western Nebraska in Middle Pliocene time, and survived in our southern states into the beginning of the Ice Age. See figures, p. 15.

Races XI-XVI of the Elephant Family: Elephantidæ

XI. THE STEGODONTS, named because of the resemblance of the toothed ridges of the grinding teeth to a series of roof-gables are more primitive than the true elephants. The Stegodonts have been traced from the Miocene of Europe into the forests of India and the East Indies to China.

XII. THE AFRICAN ELEPHANTS, OR LOXODONTS, distinguished by their lozenge-shaped grinders. See upper figure p. 18. Related forms attained gigantic size in southern Europe and in India, dwarfing into the diminutive species of the Mediterranean islands. See lower figure p. 6.

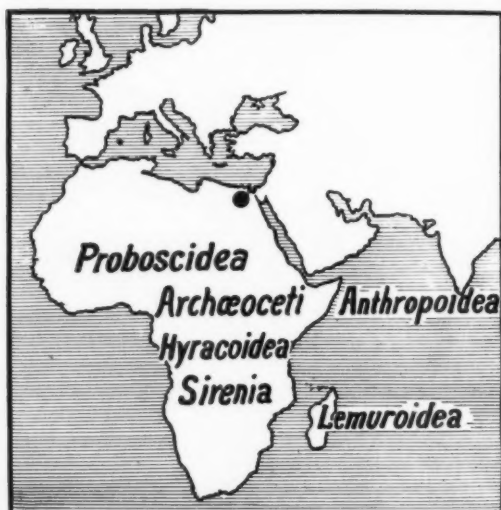
XIII. THE SOUTHERN MAMMOTHS (*Archidiskodon*, signifying ancient crested). First known in India, migrating westward into southern Europe, eastward by Bering Strait into America, where they arrived in early Glacial time, and gave rise to the imperial mammoth. See figure p. 20.

¹The series of illustrations throughout the article are all to a uniform scale, with the exception of the head-piece and tailpiece.

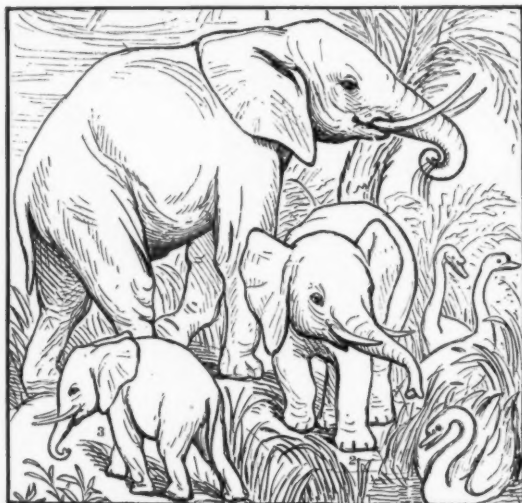
XIV. PARELEPHAS, signifying a collateral to the true *Elephas*. Mammoths of the temperate zone. First known in Europe, traced into America, where they arrived in mid-Glacial time, and gave rise to the great Jeffersonian mammoth. See frontispiece.

XV. THE WOOLLY MAMMOTH (the *Elephas primigenius* of Blumenbach). First discovered in northern Germany and in England. It crossed northern Asia, and arrived in America in late Glacial time. See figure p. 21.

XVI. THE TRUE ELEPHANTS (the *Elephas* of Linnæus), probably originating in northern Asia. First known in India early in the Age of Man, and giving rise to the recent species of India, Burma, and Ceylon. See lower figure p. 18.



African home of the primitive mastodonts.—The word "Proboscidea" as printed in 1900 and supplemented in the present map by the black dot (●) indicates the Fayûm Desert of Egypt, where these animals were discovered in 1903

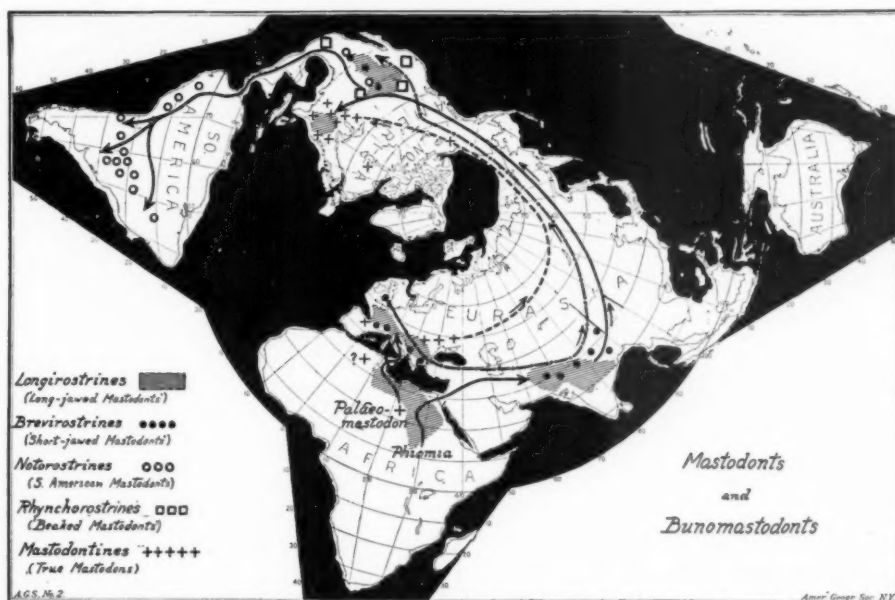


Pygmy elephants of Malta and of the other Mediterranean islands, as restored by Leith Adams in 1870, namely, 1, *Loxodonta (Pilgrimia) mnaidræ*; 2, *L. (Pilgrimia) melitensis*; and 3, *L. (Pilgrimia) falconeri*, the smallest. $\frac{1}{100}$ natural size

So strong was the migratory impulse that only six out of these sixteen races of mastodonts and elephants failed to reach America. The Stegodonts (Race XI), one of these six groups of 'stay-at-homes,' were confined, according to the writer's theory, to the warm southern forests of India, to China, Japan, and the East Indies, when these islands were connected with the mainland. The true African elephants, or Loxodonts (Race XII), never left the African continent, although the somewhat closely related pygmy elephants of the Mediterranean islands (see lower figure on this page) and the giant straight-tusked elephants of India and southern Europe were great travelers. The true Indian elephant (Race XVI) never went beyond the confines of Asia, and its Asiatic ancestors still await discovery; their probable homeland was in the great northern plateaus and forests. The amphibious Mæritheres (Race I) were closely bound by their river habitat to Africa and thus far have not been recognized elsewhere. The Dinotheres (Race II), notwithstanding their long limbs and gigantic size, wandered only east and west in their European and Asiatic homelands. The 'yoke-toothed



Theoretic migration routes of the mastodont family from their center (●) in Africa to all of the continents excepting Australia. The cradle of the elephant family is still unknown



Actual migration routes of the long-jawed mastodonts (*Longirostrinae*) and of the true mastodon (*Mastodontinae*) from their actual center of origin in north Africa as indicated by their respective symbols. Note also the migration routes of the *Brevirostrines*, *Notorostrines*, and *Rhynchorostrines*

mastodonts,' or *Zygodolophodonts* (Race IV), never reached America and are not treated fully in this article.

The successive times of departure and arrival of the ten wandering races as contrasted with the 'stay-at-homes'

cannot be fixed exactly. En route from Asia to North America, they were all forced to come by way of the northern Bering Strait, then an isthmus. Some races, like the 'beak-jawed mastodonts,' are very rare and are as yet known only by a few specimens, which are of highly characteristic and easily distinguishable form and associated habit. All the arrivals were naturally subsequent to the early evolution of the sixteen races of proboscideans in the African and Eurasiatic continents. In some cases the migrations appear to have been very gradual; for example, the 'long-jawed mastodonts' (Race V), as represented by *Phiomia*, appear in the Oligocene of Egypt; they spread all over Europe in Miocene time, and were fairly abundant in Nebraska and Colorado in Pliocene time. At the other extreme are such instances of rapid traveling as that represented by the southern mammoth, which appears in the Upper Pliocene of Europe and in the advancing Ice Age of North America. Next in point of interest is the evidence of strong climatic preferences; it would appear that the south temperate and north temperate races of elephants sought corresponding and congenial life zones for their prevailing habitat, as do the Italians, the Germans, and the Scandinavians in the human migrations of our day.

Thus three kinds of mammoths are distributed on different isotherms, as indicated in the table herewith.

Proboscideans have always been fastidious in their feeding habits. Con-

sistent with their choice of similar isotherms conditioning the flora and fauna of their times, these clever animals coming from the Old World also sought out similar habitats in America, whether of northern or southern forests, savannas, stream borders, or more or less arid and desert zones. For example, we have proof of the arrival of Race X (the Brevirostrines, genus *Stegomastodon*) in the rapidly desiccating areas of western Texas and western Arizona, where they competed for food with other desert-loving forms, like the horses, the camels, and the armored glyptodonts (*Glyptotherium*) of South America. Superb adaptations to these different degrees of temperature, different kinds of food, and more or less moist or arid atmosphere appear not only in the tusks and in the grinding teeth (which are beautifully preserved in the fossil condition), but also doubtless in the unique shaping of the upper lip into the organ known as the proboscis, which gives these animals their ordinal name Proboscidea.

RACE I, THE MERITHERES, AND RACE II, THE DINOTHERES

THE MERITHERES (RACE I).—These are the oldest proboscideans known at present, the most primitive and diminutive. Their remains occur in the estuarine and fluviatile sands of the primordial river Nile, which the German geologist, Blanckenhorn, named 'Ur-Nile.' The pair of enlarged upper and lower tusks abrade each other as in the hippopotami; were it not for the fact that these teeth are comparable to the pair of incisors

CLIMATIC TABLE

KINDS OF MAMMOTHS	EURASIA	AMERICA
XV. WOOLLY MAMMOTH	Boreal and circumpolar habitat	Boreal habitat and borders of glacial ice sheet
XIV. TROGONOTHERIAN MAMMOTH (<i>Parelephas</i>)	Mid-temperate regions	Mid-temperate regions
XIII. SOUTHERN MAMMOTHS	South temperate: <i>Elephas meridionalis</i>	South temperate: imperial mammoth (<i>Elephas imperator</i>)



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Moeritherium on the borders of the primitive river Nile, now the Fayûm of Egypt. After restoration (1907) by Osborn and Knight; $\frac{1}{100}$ natural size

enlarged into tusks in all other proboscideans, and that the grinding teeth are also comparable to the grinders of all the higher mastodonts, we might question the relationship of these animals to the higher proboscideans, because their amphibious habits separate them so markedly from the other members of their order. They disappeared abundantly in the Ur-Nile but are not known to have migrated into Europe or to have left descendants.

THE DINOTHERES (RACE II).—Teeth, jaw fragments, and an astragalus of the *Dinotheres* had been found and described between the years 1715 and 1758, but it was not until 1828 that the famous lower jaw, named by Kaup in 1829 *Dinotherium giganteum*, was discovered at Eppelsheim, Germany. The *Dinotheres* appear abundantly in the Miocene of Europe and we are inclined to believe that they sprang from African ancestors, because one of these ancestors has recently been discovered.¹ As they are distinguished by sharply crested teeth and by a pair of huge down-turned lower incisor tusks, it was long supposed that, like the *Moeritheres*, they too were amphibious in habit, but this hypothesis has been weakened by the discovery of a complete skeleton, which shows that these proboscideans had very tall

limbs, with high body proportions altogether different from those of the *Moeritheres* and of the existing hippopotami; in fact, all amphibious mammals have either short limbs or no limbs at all. Whatever their habits and special habitat, the *Dinotheres* attained gigantic size, as evidenced by the *Dinotherium gigantissimum* of Roumania. They reached India, but thus far there is no evidence of their having penetrated as far as China and still less of their having approached the American continent.

RACES V AND III. THE LONG-JAWED MASTODONTS AND THE TRUE MASTODONS

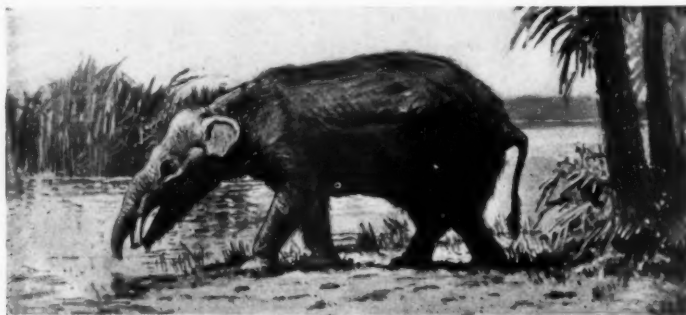
THE LONG-JAWED MASTODONTS (RACE V).—These animals derive their scientific name 'Longirostrines' from their extremely long and slender jaws, which far surpass in length those of any other land mammal thus far discovered. At the extremity of the lower jaw is a pair of shovel-shaped lower tusks, and there is no doubt that these tusks were used, after the manner of a trowel or spade, in the digging out and uprooting of plants. That this unique function gave these animals very great advantage over their rivals is demonstrated by the rapid spread of the Longirostrines eastward into India, thence northward into China and America, and all the while they were increasing in size and power until as a culmination the massive animal known as *Tri-*

¹This is *Dinotherium hohleyi* from the east side of Victoria Nyansa, described in 1911 by the late Charles W. Andrews, of the British Museum, found in beds attributed to Lower or Middle Miocene age.

lophodon giganteus, discovered by Mr. Troxell in South Dakota, attains a height nearly equaling that of our giant American mastodon. It is difficult to believe that this giant springs from the relatively slender North African Longirostrine, to which the name *Phiomia* has been given in reference to the proximity of its former habitat to the Fayûm of Egypt, the *Phiomia* of the Greeks; yet when we examine minutely the horizontally placed upper and lower tusks of *Phiomia*, the long narrow grinding teeth harmonic with the long jaw, and the three crests of the intermediate grinding teeth, there can be little doubt that *Phiomia osborni* is a progenitor of the race that gave rise to the *Trilophodon angustidens* of Europe, to the *Trilophodon palæindicus* of India, and to the numerous long-jawed species recently discovered in South Dakota, Nebraska, and Colorado by

condition, hardly more complex than those of the Egyptian *Phiomia*, in which the jaw measures two feet six inches. To our mind, the Longirostrines relied very largely upon their superior and inferior tusks for the gathering in of food, which was rapidly masticated and readily swallowed because of its relatively succulent nature.

THE TRUE MASTODONS (RACE III).—The true mastodons of our American forests appear to have arisen from the diminutive *Palæomastodon* of the primordial river Nile. The reason these animals have left no trace of their 10,000-mile and 2,000,000-year journey from the Nile region to the forests bordering the Ohio and the Hudson rivers is that fossilization of forest-living fauna has always been rare. The ancestral *Palæomastodon* of the Nile region is itself very rare; in the American Museum collection there are

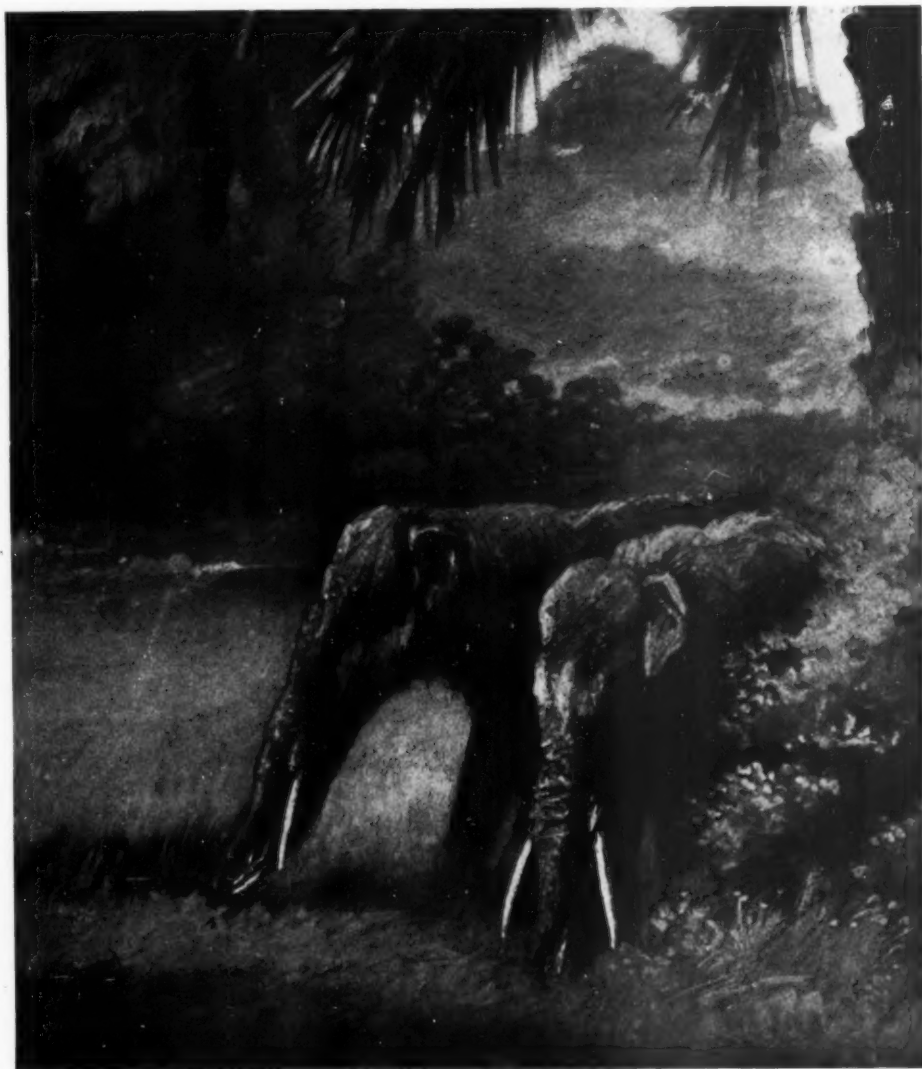


Copyrighted by the American Museum of Natural History
Long-jawed mastodont (*Phiomia osborni*) on the borders of the primitive river Nile, now the Fayûm of Egypt. After restoration by Osborn and Knight; $\frac{1}{10}$ natural size

Prof. Erwin H. Barbour of the University of Nebraska, by Mr. Harold Cook of western Nebraska, and by Mr. E. L. Troxell mentioned above.

In these American Longirostrines the elongation of the lower jaw and tusks reaches the incredible extreme of six feet, seven inches in the species *Trilophodon lulli*. Jealous of her endowments, nature kept the grinding teeth of these animals in very simple

forty-eight specimens of the long-jawed *Phiomia* to seven specimens of *Palæomastodon*; not even fossilized teeth of this race were scattered in Europe to show the route. Thus, while the woolly mammoth left an overwhelming number of fossilized remains which were discovered in western Europe from the end of the eighteenth century onward, the true mastodon was first found on the banks of the Hud-



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Long-jawed mastodons (*Trilophodon giganteus*) from the Lower Pliocene beds of South Dakota. After restoration by Osborn and Knight; $\frac{1}{10}$ natural size

son (1705) and the Ohio (1739). The Ohio fossils were fully characterized by the great French naturalist Buffon as a distinct species belonging to the epoch of the elephants although Buffon did not give the animal a name. Johann Friedrich Blumenbach, who named the woolly mammoth *Elephas primigenius* in 1799, in the same communication placed the name OHIO-INCOGNITUM beneath the figure of the tooth of

the American mastodon. These animals now rival the mammoth, as the best-known of all the extinct proboscideans; thousands of teeth and jaws, as well as more or less complete skeletons have been found, chiefly in the Fourth Glacial swamps and marshes of our Middle and Eastern States.

In contrast with the long-jawed mastodons, the true mastodons are short-jawed. Their lower tusks are



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True mastodon (*Mastodon americanus*) from the Pleistocene beds of New York. After restoration by Osborn and Knight; $\frac{1}{10}$ natural size

variable; the upper tusks curve upwards and inwards, like those of the elephants, and served for uprooting plants and for defensive and offensive purposes, while the proboscis was the main 'food getter' for the huge bodily frame.

RACES VI, VII, AND VIII. TETRALOPHODONTS, SERRIDENTINES, AND BEAK-JAWED MASTODONTS

THE FOUR-CRESTED MASTODONTS (RACE VI).—In 1832 Europe was greatly stirred by the discovery in the Lower Pliocene of Eppelsheim, Germany, of a mastodont with *four* instead of *three* ridge crests on its intermediate grinding teeth. Hugh Falconer based upon this character the appropriate name *Tetralophodon* (i.e. four-crested teeth) as distinguished from *Trilophodon*, the designation of the mastodonts with three ridge crests. In

these animals with four-crested teeth the jaws are not so extremely elongated for shovel and spade work as in the long-jawed mastodonts (Race V), but, by way of compensation, the grinding teeth became much more complex because they had to do far more work. While the back grinders of the long-jawed mastodonts remain very simple and never exceed four and a half ridge crests, the back grinders of the Tetralophodonts rise to seven and a half ridge crests and become adapted to their very long and arduous life work, culminating in the stage which the writer has named *Tetralophodon* (*Morrillia*) *barboursi*, after Dr. Erwin H. Barbour, the geologist and explorer, and the Honorable Charles H. Morrill, patron and benefactor of the exploration of the extinct life of Nebraska. The Tetralophodonts are in all coun-

tries very rare, yet we can trace their long migration through eastern Europe into India and China, until finally they arrive in Kansas and Nebraska. The jaws remain of medium length, the lower tusk is not as yet known; the upper tusk curves downwards and outwards.

THE SERRIDENTINES (RACE VII).—The Serridentines, or 'serrate-toothed mastodonts,' have only recently, as a result of the investigations of the writer, become distinguished from the long-jawed mastodonts, on the basis of the structure of the relatively few teeth found in ancient forest or lignitic

one member of this race succumbed and left his jaw to become a fossil on one of the ancient rivers of Mongolia, and here it was unearthed by the Third Asiatic Expedition in 1922 and subsequently christened *Serridentinus mongoliensis*. Eight thousand miles eastward and southward of this spot, which is in the desert of Gobi, the Americanized descendants are found in the marls near Santa Fé, New Mexico, and in the ancient river sands near Clarendon, Texas, in a formation of Lower Pliocene age. A beautiful restoration, made under the direction of the writer, from a nearly complete



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Serrate-toothed mastodont (*Serridentinus productus*) tree-browsing; as found fossil near Clarendon in northern Texas. After restoration by Osborn and Knight; $\frac{1}{50}$ natural size

deposits of France, Switzerland, and Austria. Yet these few teeth afford indubitable proof that these Serridentines are not to be confused either with the long-jawed mastodonts (= *Trilophodon*) or with the medium-jawed mastodonts (= *Tetralophodon*). They form a race of their own, to which the generic name *Serridentinus* has been given. En route to America

skeleton of a Serridentine of northern Texas is reproduced above. It shows the animal reaching for foliage with its proboscis, aided by a lower jaw with tusks of medium length, a jaw more elongate than in the true mastodonts but less elongate than in the extremely long-jawed forms.

THE BEAK-JAWED MASTODONTS (RACE VIII).—The 'beak-jawed mas-

todonts,' technically known as Rhynchostrines, are readily distinguished from all other mastodonts by the sharp downward curvature of the anterior portion of the jaw into a beaklike prolongation, in which are inserted two downwardly pointed tusks flattened on the sides. It was due to this unique adaptation of the jaw and tusks for uprooting plants and roots that Falconer in 1856-68 applied the name *Rhynchotherium* to the animal under the following circumstances: "At Genoa I saw a cast of a large lower jaw of a Mastodon from Mexico, with an enormous *bec* abruptly deflected downwards and containing one very large lower incisor. The beak is much thicker than in *M. (Trilophodon) angustidens* and larger than in *M. (Tetralophodon) longirostris*. You know that every one (Laurillard, Gervais, etc.) has insisted on the absence of the lower incisors from both of the South American species. The outline of the jaw resembles very much the figure in Alcide D'Orbigny's Voyage, described by Laurillard as *M. Andium*. The specimen is unpublished material and I was therefore only allowed to examine it very cursorily. The Genoese palaeontologists had provisionally named it *Rhynchotherium*, from the enormous development of the beak, approaching *Dinotherium*."

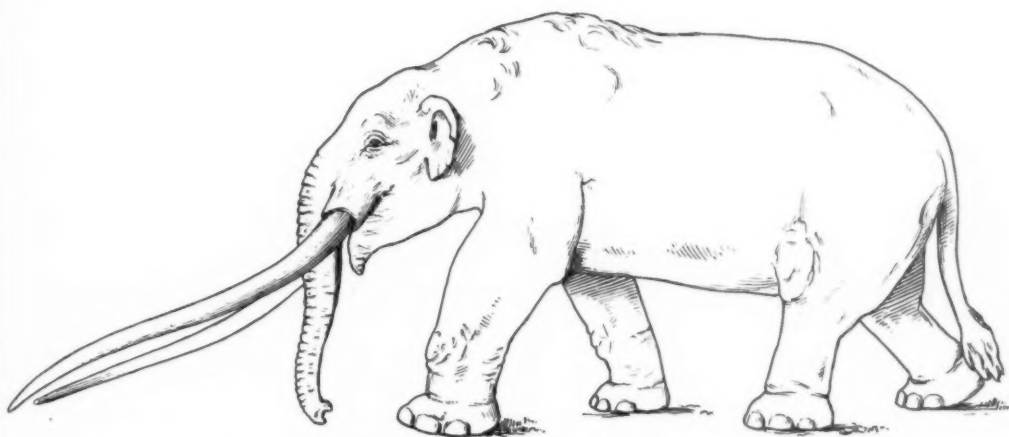
Very few remains of this 'beak-jawed mastodont' have been discovered, and it has required long study to work out the peculiar adaptations of the dentition, which consists of downturned upper and lower tusks and of very broad and simple upper and lower grinding teeth. Traces of the 'beak-jawed mastodonts' occur in Oregon, in Montana, in Colorado, and in California, but thus far the best-preserved jaws are those from Mexico, the region from which came the specimen that

the keen eye of Falconer first recognized as a beak-jawed animal quite distinct from the 'long-jawed mastodont' of western Europe.

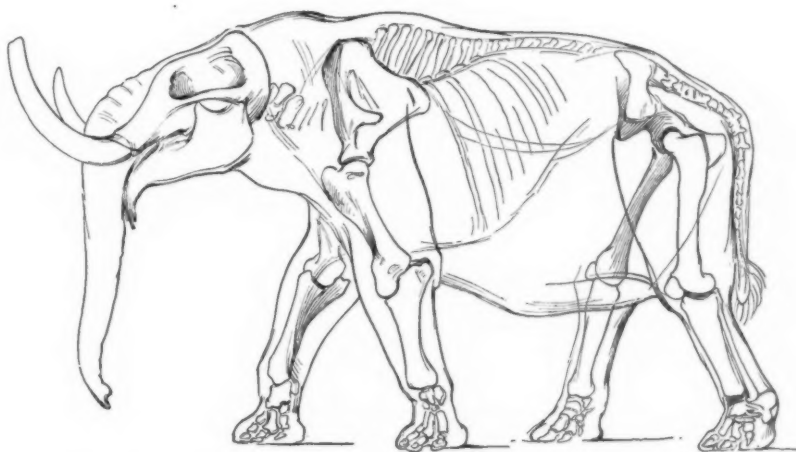
RACE X, THE SHORT-JAWED BREVI-ROSTRINES, AND RACE IX, THE NOTOROSTRINES

Races X and IX present a marked contrast to all the races preceding, in the shortening of the lower jaw and the disappearance of the lower tusks, which transfer to the upper tusks, the proboscis, and the upper and lower grinding teeth the whole function of collecting the food and of masticating it before it enters the long process of digestion and assimilation whereby the relatively feeble energy of plant life is transformed into the commanding energy of these proboscideans.

The back grinders, or third upper and lower molars, are, on the whole, the most characteristic part of the entire anatomy of these and other proboscideans, even more distinctive than the tusks. Many proboscideans resemble each other in the general shape of the superior tusks, which may display substantially the same curvature and shape in nine of the sixteen races which are here considered; this tendency is due to the fact that in all these races the upper tusks perform the same functions of offense and defense and are tools of great value in the uprooting of plants and small trees. It is true that there are in the tusks distinct differences of curvature and of diameter which become increasingly apparent as the animals attain old age, but the tusks of the young of the Indian elephants, of the woolly mammoth, of the Jeffersonian and of the imperial mammoths, of the African elephants, and of the Stegodonts are not readily distinguishable from the upper tusks of the true mastodons nor from the two tusks of the short-jawed



Short-jawed mastodont of Auvergne, France, (*Anancus arvernensis*), highly characteristic of the Upper Pliocene of Italy, southern France, and Great Britain. After restoration by Osborn and Knight; $\frac{1}{50}$ natural size



Short-jawed mastodont of southern Arizona (*Stegomastodon arizonæ* Gidley), as discovered by J. W. Gidley in the San Pedro beds. After restoration by Knight; $\frac{1}{50}$ natural size

aces we are now considering, namely, the Brevirostrines, the European and American genera of which are illustrated on p. 15, and the Notorostrines.

Clearly to distinguish the sixteen races of proboscideans from one another we must study the back grinders with extreme care, and observe that these grinders are constantly changing their form to compensate for the gains and losses in the anterior grinders and in the upper and lower tusks. Thus, while the external appearance of the Brevirostrines and Notorostrines is not wholly dissimilar, the structure of the back grinders is radically at variance in the two races, and a very tyro in odontography could not fail to distinguish these grinders.

THE BREVIROSTRINES (RACE X).—Very early in their history the Brevirostrines began to lose their lower tusks with the rapid shortening of the lower jaws; in recognition of these changes, one of the first of these fossils found in France was termed '*Mastodon brevirostris*,' or 'short-jawed mastodont.' As in all other proboscideans, the two compensations were, first, a great increase in size of the upper tusks, which became excessively long and straight in the mastodont of Auvergne, France, and short and massive in the mastodont of Arizona (see figures, p. 15), and, second, a novel and complex mechanism which developed in the back grinders. The first step in this new food-grinding adaptation is seen in the Brevirostrine of Auvergne (*Anancus arvernensis*) and in its distant cousin of India (*Pentalophodon sivalensis*), namely, a twisting of the outer and inner grinding-tooth cones so that they alternate on the inner and outer sides of the teeth. Meanwhile in the Indian *Pentalophodon* five ridge crests are added to the teeth in front of the back grinders, and the crowns of the back

grinders are heightened. These two new devices in grinding-tooth construction were so successful that these animals increased in numbers in Eurasia and achieved their long journey to North America, where they first appear in western Nebraska, subsequently spreading southward into Texas and Arizona. The veteran paleontologist, Joseph Leidy, was so impressed with the complexity of these Brevirostrine grinding teeth that he thought the animal that bore them worthy of the name *Mastodon mirificus*, signifying the 'wonderful mastodon.' This complexity went on increasing by the addition and complication of the enamel foldings until the crown became a veritable labyrinth of dental tissue, well adapted to the hard grasses and tough woody fiber of the plants then becoming characteristic of the great American desert. It is by this condition of the teeth, ever growing more and more complex, that we trace these animals southward through the species *Stegomastodon* (*Mastodon*) *mirificus* of Nebraska into the *S. texanus* of Texas, thence into the *S. arizonæ* of the ancient playa lakes of Arizona, and finally into the giant *S. aftonix* of the First Inter-glacial epoch of Iowa.

Thus, this long and eventful journey from the Auvergne region of France and the Norfolk region of England, through India, into the American desert, was rendered possible only by the constant evolution and improvement of the grinding teeth until they attained the highest degree of perfection of their kind.

THE NOTOROSTRINES (RACE IX).—These animals take their name from the Latinized Greek word *Nōtus*, signifying the south wind, that blew upon them as they left southern California, where their remains have recently been discovered by Mr. Childs Frick, and

journeyed southward along the Andes to the region now known as the Argentine. As discovered in Neogaea, or South America, it was appropriate that Cuvier should name one of these species *Mastodon humboldtii*, in reference to the travels of Alexander von Humboldt, and the other, *Mastodon andium*, commemorating the discovery of remains of this species on the slopes of the Andes.

In these Notorostrines the lower jaws are in process of abbreviation with corresponding loss of the lower incisive tusks, an abbreviation which does not go so fast or so far as in the extremely short-jawed Brevirostrines just described. The superior tusks contain a long ribbon of enamel on the outer side, and as the tusk rotates on its own axis, this enamel ribbon is carried around to the inner side in a corkscrew spiral form, a peculiarity not observed in any other proboscidean. This powerful tusk was so effective that, again following her principle of economy, nature kept the back grinders in a relatively simple condition in the species now known as *Dibelodon* (*Mastodon*) *andium*. In its sister form, *Cuvieronius* (*Mastodon*) *humboldtii*, named in honor of both Cuvier and von Humboldt, the upper tusks are of simpler upturned form, without the enamel ribbon, and the grinding teeth at once become more complex by means of the enamel foldings known as double trefoils.

RACES XII AND XVI, THE LIVING ELEPHANTS, AND RACE XI, THE STEGODONTS

THE LIVING ELEPHANTS (RACES XII AND XVI).—We now turn to the history of the elephant family, Elephantidæ, the second great division of the proboscideans, the two living examples of which are the true elephants of India belonging to the genus *Elephas*

of Linnæus, and the elephants of Africa belonging to the genus *Loxodonta* of Cuvier. We know nothing of the direct ancestral history, or of the immediate ancestors, of either *Elephas* or *Loxodonta*; this history still lies buried in the rocks of the great Eurasiatic continent north of India and in the vast unexplored strata of central Africa, but we look forward confidently to the filling in of these missing chapters in proboscidean history. As our knowledge stands at present, the Indian elephant suddenly appears fully formed during the Age of Man and the same is true of the African elephant. Attempts to establish the descent of the Indian or African races either from Race XI (the Stegodonts) or from Races XIII-XV (the Mammoths) will not stand the test of the higher criticism of palæontologists. Yet it appears certain that all the elephants sprang from ancestors like the Stegodonts.

THE STEGODONTS (RACE XI).—From Miocene to Pleistocene time, these very primitive elephants known as Stegodonts were dwellers in the tropical forests, extending from India and the East Indies to China. Differing from the mastodont family, the Stegodonts have a new kind of grinding tooth with multiple ridge crests, from which the grinding teeth of all the higher elephant races may have been derived, and it is not improbable that a certain branch of the Stegodont family wandered into northern Asia and was there transformed into some of the primitive members of the elephant family; such transformation certainly did not occur in southern Asia, where the Stegodonts have their own independent history that culminated in the prodigious and widespread Stegodontines, which left their fossil remains in the same deposits with the earliest of the mammoths. The best-known among these giant Stegodonts is the



Living African elephant (*Loxodonta africana*) in the forests of central Africa. After photograph by Carl E. Akeley; $\frac{1}{10}$ natural size



Courtesy of New York Zoological Society
Living Indian elephant (*Elephas indicus*) and living dwarf Congo elephant (*Loxodonta africana pumilio*) in the New York Zoological Park. After photograph by Elwin R. Sanborn; $\frac{1}{10}$ natural size

species *Stegodon ganesa*, named after one of the legendary deities of India. It is contemporary with a giant true elephant related to the African.

THE THREE RACES OF MAMMOTHS (XIII, XIV, XV) WHICH REACHED AMERICA

The name *Mammut*, probably derived from the Tartar *mama*, signifying earth, in allusion to the discovery of fossilized bones buried in the earth, properly belongs to the northern or woolly mammoth, *Elephas primigenius*, the primordial elephant. The term mammoth is used in the present article in a much broader significance to embrace three great branches of the elephant family. Two of them—the imperial mammoth and the Jeffersonian mammoth,—resemble the woolly mammoth in the architecture of the cranium and in the strong incurvature of the superior tusks, as greatly as they differ from this boreal elephant in the structure of the grinding teeth. The cranium rises into a high acute peak and the forehead is concave instead of being plane and flattened as in the African elephant, or prominent and domelike as in the Indian elephant (see upper and lower figures respectively, p. 18). There are many other features which unite the three races of mammoths among themselves and which separate them from the African and Indian elephants, but the one of paramount interest to us is that these animals were greater wanderers than either the Indian or African elephants and successively entered the American continent as follows:

The imperial mammoth (Race XIII), late in the Age of Mammals, early in the Age of Man.

The Jeffersonian mammoth (Race XIV), during the Age of Man.

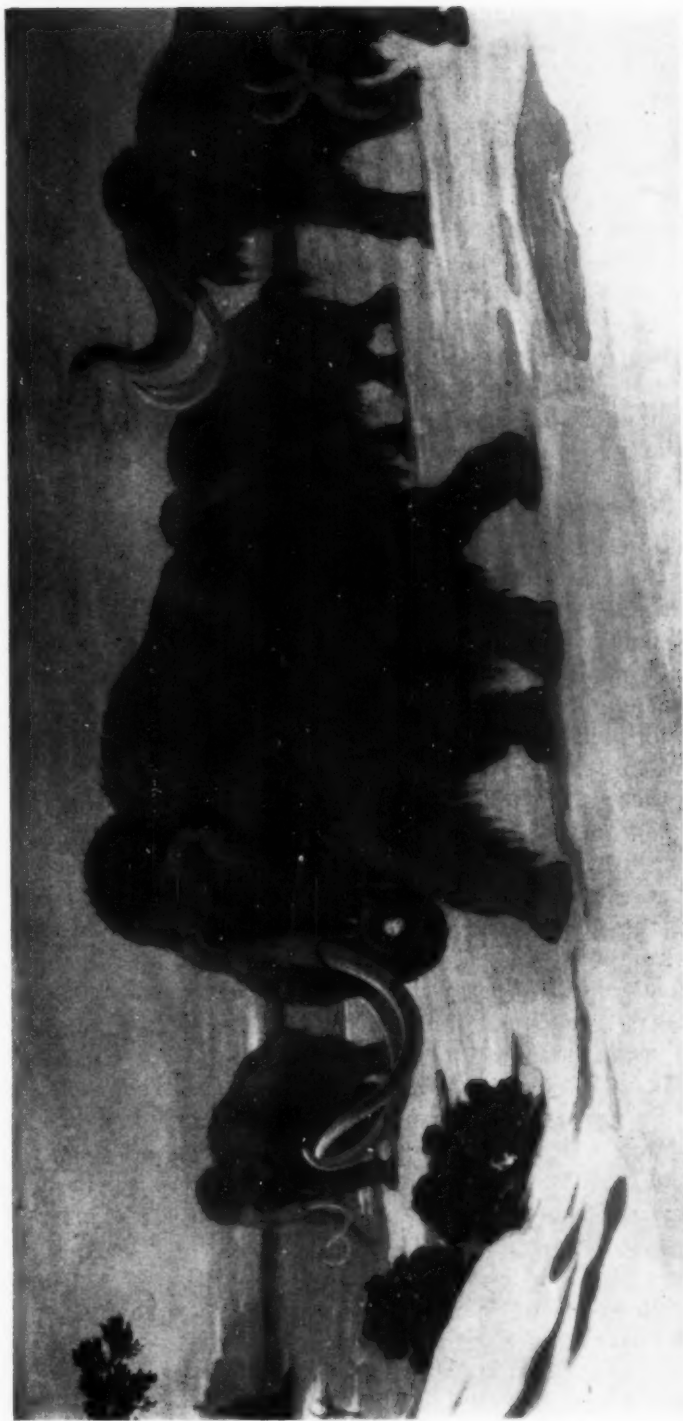
The woolly mammoth (Race XV), late in the Age of Man, during the period of the last great glaciation.

THE IMPERIAL MAMMOTH (RACE XIII).—This majestic animal was discovered by Ferdinand Hayden, the exploring geologist, in Nebraska, and described by Joseph Leidy in 1858 as *Elephas imperator*, signifying the 'imperial elephant' in reference to the surpassing size of the grinding teeth and the impressive height of the animal. This designation has been more than justified by subsequent discoveries of remains of this gigantic animal in Nebraska, Kansas, Iowa, Texas, California, and Mexico, consisting of portions of teeth, skulls, and skeletons sufficient to establish the fact that the full-grown animals attained a height of 13½ to 14 feet, exceeding by 2½ feet the tallest of the existing African elephants and rivaled only by the gigantic straight-tusked elephant of India and western Europe known as *Loxodonta antiqua*.

The grinding teeth are readily distinguished by their surpassing size and by the relative paucity of the enamel ridge plates, which never exceed twenty in number; the ridge plates are very far apart and the enamel bands are broad, whereas in the woolly mammoth the enamel of the ridge plates is excessively fine, the grinding teeth are relatively small, and the number of ridge plates amounts to twenty-seven. It is in reference to this massive but primitive structure of the grinding teeth that Prof. Pohlig has named these animals *Archidiskodon*, signifying primitive ridge plates. The adaptation of these huge, coarse grinders was to tree-and shrub-browsing and the crushing of great masses of leaves and twigs; these imperial mammoths were therefore probably browsers, and with the reduction and disappearance of the western forests, they diminished in numbers and became extinct—the last of a noble line which traces its lineage



INDIVIDUAL MAMMOTH (ARCHIDISKODON IMPERATOR) OF NEBRASKA AND TEXAS. AFTER RESTORATION BY OSBORN AND KNIGHT; $\frac{1}{50}$ NATURAL SIZE



WOOLLY MAMMOTH (*MAMMONTEUS PRIMIGENIUS*) OF THE RIVER SOMME, FRANCE, IN LATE GLACIAL TIME. AFTER RESTORATION BY OSBORN AND KNIGHT; $\frac{1}{50}$ NATURAL SIZE

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back to *Archidiskodon planifrons* in the Upper Pliocene of India and is related to the giant *Archidiskodon meridionalis* of the Pliocene and Lower Pleistocene forests of Italy, France, and Great Britain. In America *Archidiskodon* attained by far its greatest size, as majestically represented in our restoration (p. 21).

THE JEFFERSONIAN MAMMOTH (RACE XIV).—It has taken many years of study to disentangle the lineage of this great immigrant from that of the imperial mammoth on the one hand and that of the woolly mammoth on the other. With the aid of Prof. Hans Pohlig of Bonn and of Prof. Charles Depéret of the University of Lyons this lineage has been traced back to Germany, to southern France, and to Great Britain, and it is now a well established fact that the Jeffersonian mammoth came from smaller and more primitive ancestors which wandered in the forests and meadows of western Europe during the first half of the Age of Man. These European forebears replaced the ancestors of the imperial mammoth and were in turn replaced by great herds of the woolly mammoth that entered Europe in the closing period of the Age of Man. These animals are so distinct from either the imperial or the woolly mammoth stock that we give them the separate generic designation of *Parelephas*, in allusion to their development parallel with the true elephants of India. Whereas the European branch of *Parelephas* became extinct, the American branch flourished exceedingly in the temperate regions of the United States, and its fossil remains are far more numerous than those of either the imperial or the woolly mammoth; *Parelephas* also endured for a long period of time and underwent a considerable evolution in

respect to its grinding teeth, from an earlier stage which we have named *Parelephas jeffersonii* (see frontispiece), in honor of President Jefferson, to a final stage in which the third upper molar possessed as many as thirty plates and the third lower molar twenty-six.

Second only in size to the imperial mammoth, the Jeffersonian mammoth succeeded its imperial forerunner and survived the severe climate of the Fourth Glaciation, at the close of which it became extinct.

THE WOOLLY MAMMOTH (RACE XV).—Late in the Age of Man arrived the woolly mammoth (p. 21), closely related to the *Elephas primigenius* of the ancient steppes and tundras of western Europe. The first to make very close comparison between the west European and the American varieties of this boreal race was Dr. Hugh Falconer, who declared that while the same number of enamel ridge plates was present in the forms of both regions, namely, twenty-four in the last molar of each jaw, the American animals were in general characterized by still finer and more compressed ridge plates than those of western Europe. Thus we may distinguish one of our own forms as *Mammonteus primigenius americanus*, while in Indiana and in Alaska we find a type of mammoth with close-fitting enamel ridge plates to the number of twenty-seven and of such exceeding fineness that we have named it *Mammonteus primigenius compressus*. This adaptation of the grinding teeth for grazing habits was to enable the animal to feed upon the hard grasses which covered the tundras and steppes of the north during the summer season. Thus the woolly mammoth was chiefly a grazer, as proved by the stomach contents of frozen carcasses recovered from the ice in Siberia.

TABLE OF COMPARATIVE HEIGHTS OF CERTAIN
ELEPHANTS AND MASTODONTS

COMMON NAME	SCIENTIFIC NAME	HEIGHT
Imperial Mammoth	<i>Archidiskodon imperator</i>	13½ feet
African Elephant	<i>Loxodonta africana</i>	11 feet 4 inches
Jeffersonian Mammoth	<i>Parelephas jeffersonii</i>	10 feet 6 inches
Indian Elephant	<i>Elephas indicus</i>	10 feet
American Mastodon	<i>Mastodon americanus</i>	9 feet 6 inches
Woolly Mammoth	<i>Mammonteus primigenius</i>	9 feet 3 inches
Giant Longirostrine	<i>Trilophodon giganteus</i>	7 feet 9 inches
Small Mediterranean Elephant	<i>Loxodonta (Pilgrimia) mnaidra</i>	7 feet
Texas Serridentine	<i>Serridentinus productus</i>	5 feet 8 inches
Small Elephant of Malta	<i>Loxodonta (Pilgrimia) melitensis</i>	5 feet
Fayûm Longirostrine	<i>Phiomia osborni</i>	4 feet 5 inches
Young Congo Elephant	<i>Loxodonta africana pumilio</i>	4 feet 5 inches
Smallest Elephant of Malta	<i>Loxodonta (Pilgrimia) falconeri</i>	3 feet
Fayûm Mæritthere	<i>Mærittherium andreusi</i>	2 feet 1 inch

The woolly mammoth is relatively diminutive in size, not much exceeding nine feet and, despite the grazing adaptation in its grinding teeth, it shows its relationship both to the imperial and the Jeffersonian mammoths in two outstanding characters, namely, the extreme acuteness of the apex of the skull and the strong incurvature of the tusks, which completely cross each other in old age and no longer serve either for purposes of combat or for the gathering of food. Remains of the woolly mammoth are relatively rare in the United States but a few fine skulls have been recovered from Indiana and from Alaska, in which the acute apex, the concave forehead, the extreme flattening and deepening of the cranium and the tooth sockets may be observed.

We know little of the external appearance of the imperial mammoth; it was probably nearly hairless like the Indian and the African elephants. The Jeffersonian mammoth, we believe, was partly hairy, for it is characteristic of the north temperate region both of Europe and the United States. The northern mammoth of the Ice Age was both hairy and woolly and was perfectly adapted to the extremely severe climate of the Arctic Circle and of the borders of the advancing ice sheets. Both in their immense geographic range and in their extremes of adaptation to different climatic zones, these three branches of the mammoth family rank as the *facile princeps* among the mammals which ruled the Northern Hemisphere during the Age of Man.



Stegomastodon arriving in Arizona. After restoration by Osborn and Knight

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Copyrighted by W. S. Taylor, 1912.

THE PRIZE OF THE WHALE HUNT

The Nootka of Vancouver Island, like the Quileute of the Olympic Peninsula, on the mainland to the south of them, are known as ardent hunters of the whale. Among both peoples a piece of blubber from the back of the animal was awarded to the chief harpooner. This was ornamented with feathers and suspended from a pole, as shown in this reproduction from a mural painting by Will S. Taylor that is one of the decorative features of the Northwest Indian hall, American Museum

Whaling of the Olympic Peninsula Indians of Washington¹

By ALBERT B. REAGAN

NOTE.—The author of this article has not visited the Quileute Indians for some years, and it is not improbable that the practices herein recorded are now a thing of the past. This does not detract, however, from their interest and significance.—EDITOR.

THIRTY-SIX miles down the Pacific coast southeast of Cape Flattery is the Indian village of Quileute. It is situated on a point of land flanked by a giant forest on one side and the pounding ocean on the other. To the west of it is James Island in the shape of a giant lobster's claw reaching toward the setting sun. Southeast of it the hissing, seething surf beats against the world-foundation stones of the Giant's Graveyard.

In this village from time immemorial have lived the Quileute Indians, a coastal people that engage in whaling. The whale principally pursued is the California gray.

The aspiring whale hunter, especially the harpooner, must first obtain a knowledge of the sea folk-tales of the tribe, which are many and varied. These include the account how Kwatte, the creator god, the transformer and trickster, deliberately paddled his big dugout canoe toward the great whirlpool that was caused by Subbus, the whale, as, lying on the bottom of the sea, he drew the surface water down through his mouth. To the very edge of the great funnel Kwatte paddled the canoe. Its prow went forward and projected over the great hollow space above Subbus' mouth. For a moment it remained suspended there. Then it went down edgewise, right down through Subbus' mouth into his gigantic stomach, with Kwatte lying snugly in its bottom.

Then Kwatte set to work. He used the big canoe as a ladder, climbing to

its top in the huge stomach. With clamshell knives he cut at the inner linings and muscles of Subbus. From side to side he moved the canoe and cut and cut. The infuriated monster plunged and pitched in his death agony but he could not get rid of his enemy. At last Subbus made one powerful lunge, but in vain. Then he rose to the surface and floated there, dead.

The huge lifeless bulk drifted to shore. There the Indians found it and started to cut it up. As they began to remove the blubber, they heard someone talking inside the carcass:

"Be careful! You people will wound me with your knives. Don't hurt me! Ouch! Look out!"

A knife penetrated the body wall into the body cavity. Another thrust of the knife made a large hole in the great stomach. And Kwatte came up through this gash and stepped out on the beach.

We may turn at this point to another myth. It tells how in a wrestling match between the sea animals and those of the land, Bear threw Whale down and scratched him on the breast. These scratches are still to be seen on the fore part of the pectoral surface of the huge monster.

The Thunder Bird is represented as engaged in dreadful battles with whales. Once this bird, after killing the powerful ocean monster, was nearly robbed of its prey by a group of people who came to the scene and cut up the whale. But scarcely had they done so when it

¹Photographs by the author, supplemented by illustrations of objects in the Northwest Indian hall of the American Museum and by a photograph obtained from Mr. George Hunt.



The Thunder Bird bearing in its talons the Whale, which, though removed from its watery medium, is represented as still spouting. From a Nootka drumhead in the American Museum

began to rain, snow, and hail. The Thunder Bird, the flash of whose eyes is the lightning and the flapping of whose wings produces the mighty winds, came flying up in anger. Soon he caused great chunks of ice to fall. The people were scared. Some tried to flee, others concealed themselves under logs and rocks to escape the wrath of this god of the air. But all were stricken and turned to stone as was also the meat of the whale. Whoever visits the scene of their fatal gathering may view their remains, represented by the great blocks that form a ridge from one end of Beaver Prairie to the other. One may even see the ribs of the whale's carcass and its massive head.

When these myths and many others of a similar nature have been learned by the harpooner, he must undergo curious and weird ordeals. He must

bathe his body in the cold salt water of the ocean two or three times each night for several moons, beginning usually in the month of December before the whaling season opens. For the purpose he selects some rock that juts out of the water and around it he swims the hours away. He pretends that the rock is a whale that has come to the surface to get air and that he is attacking it. Then, in turn, he makes believe that he himself is a whale: he tries in every way to imitate a whale's motion, diving, coming to the surface, spouting, and the like. After a time he comes ashore from his whale-killing play and dries himself with a blanket or a bear skin. He then rubs himself with the twigs of a tree that his family has held sacred for generations. In doing so he must take care that the head of this body brush is pointing to the region

where the sun rises. His task completed, he must not throw the brush away heedlessly, as that would bring great misfortune in addition to shortening his life. While he thus rubs himself he prays to Se-kah-til, the mother earth, who especially aids whalers in their quest for the king of the sea. In addition to bathing, he also wanders about graveyards and secluded places at night. Often he gathers a number of human skulls and trails them behind him on a rope made of whale sinew, or practises similar gruesome rites.

While he is thus engaged out of doors, other members of the respective whaling crews are going through various incantations indoors to invoke the aid of the gods in the coming whaling season. They shake whale rattles and crawl and flounder around on the floor in imitation of the movements of a whale, especially those of a whale in

his dying struggles. The bathing and other rites they indulge in so that the whale may not detect them and also to gain the good will of the deities.

Thereupon a whaling canoe and the prerequisites for the whaling trip are secured. The harpoon and attached gear, a few buoys, a sufficient supply of paddles, and food enough for eight men—the complement of a canoe—are essentials in a venture on the deep that has for its object the killing of the largest animal of the seas.

The harpoon head is a piece of whale rib, or a flat piece of copper, iron, or steel, according to the hunter's choice. Attached to it are two barbs made of elk or deer horn, or of steel. These are fitted together very tightly and fastened in place by cords. The entire harpoon, including the barbs, is then covered with spruce gum to protect it and to aid in holding the parts in place.

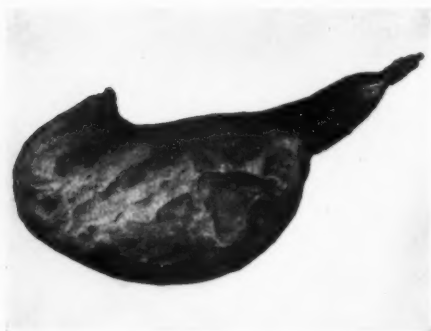


Courtesy of Mr. George Hunt

The Nootka whale "house" is a more or less open structure, constructed of posts and poles. In it are many wooden figures of men and the skulls of whalers of the past; and here the chief harpooner was accustomed to engage in various rites that are a necessary preliminary to a successful hunt

When this gum is sufficiently hardened, the harpoon is scraped and ground until it is very sharp and will penetrate flesh easily.

To the barbed head of the harpoon is attached a lanyard from thirty to forty feet in length. This lanyard is made of whale sinew or cedar twigs or roots twisted into a rope. To make it still stronger, twine of whale sinew is wound



Floats made of sealskin or of a seal's stomach were attached to a line fastened to the harpoon and prevented the wounded animal from seeking escape in the watery depths

very tightly around it throughout its entire length.

The staff is usually composed of two pieces of yew wood, which are spliced together neatly and firmly with bark or sinew. It is from eighteen to twenty feet in length, being thickest in the middle and tapering off toward each end. It is inserted in the harpoon head, and the end of the lanyard is fastened to a buoy.

Each buoy is a sealskin that has been taken off whole with the hair left inside, as in skinning small fur animals for market. The holes left by the removal of the head, flippers, and tail are tied up perfectly tight; and then the skin bag thus formed is inflated.

When the harpoon is driven into the whale, the barbs to which the lanyard is attached, penetrate the animal and

remain firmly fastened. The staff is then removed from the harpoon and put into the canoe. To the floating end of the lanyard is attached a long rope on which buoys have been fastened to keep the whale from sinking. Often as many as forty buoys are thus employed. The more buoys, the more difficult it is for the struggling monster to plunge beneath the surface, and the easier for the whalers to attack it with their spears and lances. The rope to which the buoys are attached is usually made of spruce limbs, which have been split into fibers and then twisted into rope.

The paddle of yew wood has a broad blade that tapers to a point; to the other end is fitted transversely a head-piece that is sufficiently long to enable the paddler to use it freely and comfortably as a hand-hold piece. Furthermore, the whole paddle is usually blackened in the fire and then polished with a vegetable compound. The canoe is a dugout that, with the exception of its prow, which is fashioned to represent the mythical river deer, is made from a single log.

When the whaling season arrives and all the preparations are completed, the weather being favorable, the whaling canoes are dragged to the beach in the gray of the early morning long before the blazing orb of day looks down into the valleys from the heights of the Olympic Mountains. There is wild excitement as the Indians haul the boats to the water's edge. The whale dancers go through their antics, shout and sing around their respective canoes as they carry the weapons of whaling out to them. In this ceremony the actors wear a black blanket, or one on which a whale has been painted. They also grease themselves with whale oil and wash their faces in it. They dance in imitation of a whale that is diving,

swimming, and floundering in his last efforts before dying.

At last the boats, with the hunting equipment and whale rattle, are launched. In another moment each of the crews is off, the man who has convinced his fellows that he has "bathed good" and that he "can catch the whale easy" being the harpooner. When they are out some distance from shore, the spouting of a whale may be seen. The crew in the boat nearest to it paddles swiftly but cautiously to the attack, while all chant in long-drawn-out crescendo to induce the whale to head toward the canoe or toward the



The harpoon with the lanyard attached is shown in the picture on the left. The barbs, made of pieces of antler, are visible at the base of the blade. Into the harpoon was inserted a long shaft similar to that depicted on the right, but this shaft was withdrawn as soon as the whale had been struck. Among the Quileute, as Mr. Reagan points out, the shaft usually consists of two sections. The one here shown was obtained, as were the harpoon and lanyard, from the Nootka; these implements are on exhibit in the American Museum





Photograph by Albert B. Reagan

In a whale hunt of the Quileute many canoes may participate, each manned by eight Indians. The elongated neck and head of the mythical river deer is just visible on the prow of one of the canoes

shore. Usually, however, it submerges before they can reach it.

When it disappears, the whalers shake their rattles for a moment as they sing. Those in the foremost boat then cease singing and row their canoe swiftly over the water to the spot where the whale is likely to come to the surface again. Everyone now nerves himself for the attack as one of the hunters signals with uplifted paddle that the decisive moment has arrived. This news is transmitted in like manner to other canoes, and also to the shore. The spectators on James Island build huge bonfires on the southeast corner of the island if the whale is seen southeast of the village; and on the southwest corner if it happens to be seen southwestward of it. This is for the purpose of advising all the whaling canoes of the approximate location of the whale to be attacked.

The whale comes to the surface again, and the native navigator has not miscalculated the probable place of emergence; he seldom does. As soon

as the huge head makes its appearance, the action begins. With measured dip the paddles move the canoe noiselessly up to within a few feet of the huge creature that is unsuspectingly spouting on the surface of a quiet swell. The hunter hurls his harpoon with all his strength, while his men, ready for every danger, bend their energies to prevent the rope from tangling. The deadly weapon is driven deeply into the whale's body, and as quick as an eye-movement the harpooner draws out the harpoon stalk. The barbed points hold fast, and instantly the buoys and rope attached are thrown into the sea. The plunging of the wounded beast begins.

Quickly the whale goes down, drawing with him the lanyard rope of the harpoon to which are attached the seal-skin buoys. These go skimming along over the water like so many tops, while the canoes follow as rapidly as they can. Again and again the whale comes to the surface, and each time he is harpooned with deadly effect. The

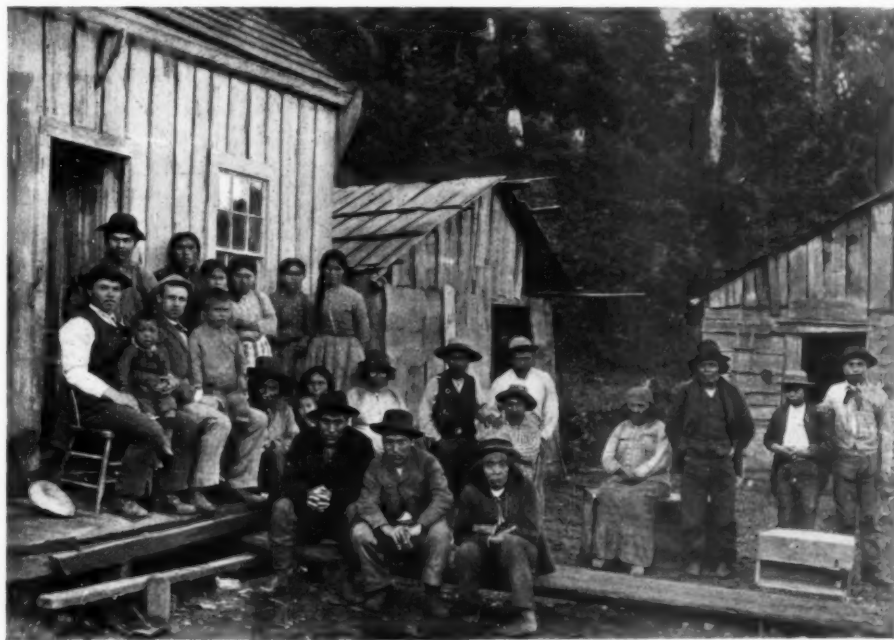
fight may continue for hours, or it may be ended in a brief time. The monster may smash a canoe in frenzied fury, and it may also break the rope and escape. As a rule, however, its speed finally slackens, and the hunters, armed with their spears and lances, then finish their work at close quarters.

As soon as it is dead, the crew or crews attach a huge cedar-root rope cable to it and commence towing it ashore. As they thus tow, they sing day and night to keep the evil spirit, *Ko-kwo-til*, from alighting on it or taking possession of it, for "should it get on it, it would make it lean." They also sing songs to *Se-kah-til*, the mother earth, to aid them in bringing it ashore.

The whale is landed as high up on the beach as possible. When the tide recedes, all who are entitled to a share swarm around the carcass with long,

thick-bladed butcher knives and begin stripping off the blubber in blocks about two feet square. The saddle is considered sacred and is always the property of the hunter who first drove his harpoon into the whale, provided that the blow proved fatal. The other parts are divided and distributed according to an established rule, so that each individual knows just how much whale blubber or meat he is to receive. The cutting up of the whale is a merry and joyous occasion, for at such times the Indians invariably seem good-tempered. If some one gets more than he can use, the surplus is given to some less-favored friend, but it is assumed that there will be a return gift either of cash or something of equivalent value. The more unfortunate ones get a share of the meat by helping themselves.

After the skin is removed, the blubber is cut into strips and boiled



A group of Quileute Indians

Photograph by Albert B. Reagan

that the oil may be extracted, large iron pots now being used for the purpose. The oil is very carefully skimmed off with clamshells or thin saucers. The blubber is then hung up in the smoke of the fish house to dry. Before being eaten, it is some-

or the seal and the whale's bladder and intestines, which have previously been inflated and dried for the purpose. The surplus oil is sold to or traded with other tribes, or is sold to logging camps or to traders for use as logging-skid grease and in general lubrication.

The skin of the whale is also considered very palatable and is usually given to the children. In fact, there is hardly any part of the animal that has not its uses for the coast natives.

The saddle is put on a pole supported at each end by a forked post, on which are hung the harpoons and lines used in the capture of the whale. It is also customary to stick eagle feathers in a row along its crest and in a bunch at each end of the pole. The saddle is then covered or sprinkled over with down. A vessel is placed underneath it to catch the dripping oil. Thereupon a "potlatch" (give-away feast dance) in honor of the whale's saddle is held, with the compliments of the harpooner who killed the whale. At this feast the participants always relate the story of the whale hunt and never fail to congratulate the host on his ability. Some one makes a speech, telling of the ancestral trait of the family or clan of the harpooner, of his past achievements, and the honor that others will bestow upon him. The ceremony is closed by a "vote of thanks," after which the guests carry home with them whatever is left of the saddle.



Photograph by Albert B. Reagan

One of the old-time Quileute whalers

times cooked for twenty minutes or more, but it is not unusual to eat it cold with dried halibut.

The extracted oil is used in eating potatoes, camas, dried clams, and boiled or dried fish, which are dipped into it. As receptacles for this oil the Indians use the stomach of the sea lion





Kispiox, one of the Kitikshan villages of the Upper Skeena River of British Columbia. An impressive feature of the communities of this region is the line of carved poles in front of the houses

The Kitikshan and Their Totem Poles¹

By LIEUT. GEORGE T. EMMONS

THE acknowledged cultural center of primitive life on the North Pacific Coast was about Dixon Entrance, where the Tsimshian of British Columbia, the Haida of Queen Charlotte's Islands, and the Tlingit of Alaska come together. Although speaking different tongues, yet through intermarriage, association, intermittent wars, and extravagant peace ceremonies, they formulated and recognized a common code of laws that regulated their intercourse with one another. Nevertheless, while they borrowed freely from one another, both in customs and industries, they ever retained their racial characteristics unimpaired. The Tsimshians, it would seem, are the latest comers to establish themselves in this region, and like the others, they are made up of different waves of migration, that have come presumably from the interior and scattered coastwise. They form three geographic divisions: the Tsimshian proper—dwellers on the seaboard,—

the Nishka of the Nass Valley, and the Kitikshan of the Upper Skeena, above the cañon, and it is of the last-mentioned that I write.

Their name signifies "Children of the Skeena," and they claim to be the parent stock from which the others have come. Their earliest tradition goes back to the subsidence of the flood, when their canoe landed on the north shore of the river, several miles below the mouth of the Bulkley. Because of its level expanse they called it Tumlaham, and around it many legends are woven. In time it became a great village, and the old man who told me the story said that so many were the people, and so loud was the noise of their voices, that geese passing in a flock overhead would become frightened and, folding their wings, would fall to the ground. Later the "Great Cold" came; snow continued to fall and the river was icebound far into the spring, when the salmon should have come to replenish the exhausted lar-

¹Photographs by the author.

ders of the Indians. Driven to desperation and resentment against the ice spirit, the chief soaked a dried salmon to make it appear as a fresh fish, and standing in his doorway, holding the fish aloft, reviled the cold, saying: "You are a weakling, you have no power. See the spring-run fish that I have taken." But this only incensed the spirit and, as the cold increased, starvation looked them in the face. Then one day a bluejay alighting over the smoke hole of a house dropped a fresh elderberry from its bill, a sign that summer had come somewhere. Thereupon the people left the village and scattered in all directions in search of food, which accounts for the other two divisions of the Tsimshian.

The country of the Kitikshan is practically included in the valleys of the Upper Skeena and its few tributaries. It is a land restricted in area and limited in resources. The flora is that of the semi-arid interior plateau, subject to long dry spells and inconvenient frosts even in midsummer. Spruce, cedar, jack pine, alder, and birch, but generally of small growth, represent the tree life. Of animals brown and black bear, mountain goat, and lynx are of common occurrence, but more important economically are the marmot and rabbit because of their abundance and the ease with which they can be taken. Caribou were found in the past but have almost disappeared since the introduction of firearms. Topographically, the land is peculiar in the isolated mountain masses of limited area that rise to great heights above the surrounding country, grim survivors of the leveling forces of earth shock, glacier, and pent-up water that are visible on every hand. The river is the artery of life of the country, and from it the people

draw their sustenance, represented by the salmon that run in from the sea each spring to seek the lakes for spawning purposes. It is also nature's highway, although a wicked water that takes its toll of life each season. It is said that in early days canoe travel was unknown and rafts alone were used for crossing at favorable points.

The country was practically unpenetrated by the white man until the Omineca gold excitement in 1867, when the Hudson's Bay Company established a post at Hazelton, and the people were released from the trade restrictions that had been put upon them by their neighbors of the lower valley, who had never permitted them to approach the coast nor to dispose of their furs to others than themselves. They lived by a narrow margin and, when abnormal conditions occurred, they were forced to sell their children to save them and themselves from starvation.

Each community was an independent band made up of two or more of the four totemic clans, that had come together through migration or intermarriage for mutual protection and social advantages. There was no central governing power either in the tribe or in the band. Each clan, or phratry, was a unit in itself, recognizing only the authority of its local chief but, in case of foreign aggression, all might band together and by common consent elect a leader for the emergency.

Their social organization was matriarchal and comprised the four exogamic clans, or phratries, in which all individuality was merged, the clan being physically, morally, and politically responsible for the acts of every member. Naturally marriage within the clan was impossible, and even a union with one of another tribe having a like

crest was not permitted. Under such a social system the children belonged absolutely to the mother's side, so the succession must follow in the clan. More often the maternal nephew was taken by the uncle at an early age, and trained by him for the succession, upon assuming which he must take the aunt to wife regardless of the disparity of years, for this assured her a home and position which otherwise she would have to forego, as neither the wife nor children could inherit from the husband or father. Such a marriage, however, did not prevent the nephew from taking other wives of his choice.

The four clans derive their names respectively from their principal crests: the frog, wolf, eagle, and fireweed; but they claim, assume, and use many subsidiary emblems that are displayed on their houses, poles, ceremonial dress, and household implements,—in fact on everything they possess. Their houses and personal names are clan possessions, referring in most instances to the crest. This is generally represented by the animal life of the country, but in addition are shown the strange forms of mythical animals that, it is believed, lived in early days and with which their ancestors had some connection, as well as natural phenomena, material objects, and—tracing relationship to the coast through migration and intermarriage—the figures of the killer whale, sea lion, halibut, and other ocean dwellers, which seem very much out of place stranded in this semi-arid country.

The people, while Tsimshian in language, organization, and culture, are necessarily hunters and trailmen due to their inland home, and a certain physical difference from the pure Tsimshian can be noticed in the slighter build and sharper features of

certain family groups, the result of constant marriage with their Babine neighbors. In manner they are dignified and quiet; they are absolutely honest, hospitable and friendly when known, although suspicious and taciturn with strangers. Pride, vanity, and oversensitiveness are their principal faults, and while cool-headed under natural conditions of danger, yet, when angry, they are as unthinking as children. I do not believe that they differ from ourselves in natural intelligence, only they have not had the opportunities to develop; but under more favorable conditions that have come to them in the opening up of this country by the railroad, they are becoming a useful and desirable population.

They live in permanent villages situated on the Upper Skeena and its tributaries. The houses, ranged in a single line, follow the trend of the shore with their gable ends facing the water. They are large, rectangular, barn-like structures, rather deeper than wide, built of spruce timbers, the smoke hole in the roof giving light and ventilation, and directly below it is the central fireplace. Communal in character, these structures housed many families, each of which occupied a fixed place around the walls, while the rear portion was occupied by the house chief.

The feature of these villages is the line of wonderfully carved tree trunks extending the length in front of the houses and separated from them by a broad roadway. While the totem pole is generally explained as a heraldic column, yet it stood for much more. Its erection was primarily a religious observance honoring the dead, for the only religion that entered into the life of this people was ancestor worship, with the death ceremonies and the feasts that followed for the honor and



The erection of a totem pole is primarily a religious observance in honor of the dead. Among the Tsimshian the curious custom prevails of placing on the pole a clothed wooden figure representing the deceased. The head and features are carved with rare fidelity, as the above example from the inland village of Kitwankool gives evidence. Rain and wind have torn to shreds the garments that once covered the jointed limbs of this effigy, which is seated on a chest containing the ashes of the man represented. The ceremonial neck ring of cedar bark, though damaged by the elements, still encircles the figure

spiritual comfort of the departed. These Indians had a firm belief in a future, and the food and articles cast into the fire upon such occasions were received in spiritual kind in a way that

it is difficult for us to understand. The pole was erected by the successor of the deceased with the assistance of the household, and it honored not only the dead but also the living, and the

descendants for all time. The family crest was shown at the top and sometimes also at the base and throughout the length of the pole, but generally the intermediate figures illustrated a legend, a hero tale of early life, or some important family happening.

The totem poles of the Kitikshan never form the entrance to the house as do some of those found on the coast, nor are they mortuary columns containing the cremated remains of the dead in recesses at the back. The Tsimshian place a portrait figure of the dead on the pole or over the grave, and among this people is found the only remaining evidence of this custom. The figure is a comparatively rude manikin jointed at the shoulders, elbows, hips, and knees, and fully clothed, so that little shows; in contrast to the other parts of the body, the head and features are carefully carved with great skill to represent as nearly as possible those of the dead.

The most striking example of this custom occurs at the old, more inland village of Kitwankool, now practically deserted, where on an old totem pole, some ten feet above the ground, is placed the figure of a young man seated on a chest containing his cremated remains. The face is very lifelike. The figure has been clothed but the elements have left only shreds of the body covering, the headdress, and the ceremonial neck ring of cedar bark. Again, at the village of Kitzegukla, below Hazelton, there is a most realistic figure of a man, seated in a chair over his remains, within a small grave house fitted with windows. In one hand he holds an old flintlock musket, such as used to be sold by the Hudson's Bay Company, and in the other, outstretched, are the bullets with which he was killed. The face,

of carved cedar, weathered to a pale brown, approximating the complexion of this people, is so lifelike, and the pose of the clothed, seated figure, so natural, that the first glance through the window gives one quite a shock.

The totem poles of the Kitikshan differ in several respects from those of the coast tribes. They are slighter—possibly from the smaller tree growth of the country—and below Hazelton, where the finest examples are found, they are more elaborately and completely carved throughout their length. From there, north, they are cruder and plainer. The finest and most intricate examples of carving are found at Kitwankool and Kitzegukla. The elements have obliterated most of the colors with which they were originally painted, but, moss-covered and weatherworn, they have lost nothing in dignity as they stand out against a background of dark-green spruces or distant snow-clad mountains.

Every pole tells a story, even if only the clan crest figure is shown, for the acquisition of this is the beginning of history when the clan took its place as a social and political body. House or family crests illustrate important happenings, generally individual in character, and often connected with the animal world, recalling a time when animals by removing their coats could assume human forms and intermarriage with them was not uncommon. The Bear, Wolf, Beaver, Frog, Owl, and Thunderbird are most in evidence on the poles in all of the Kitikshan villages, and while somewhat conventionalized to accommodate their shape to the restrictions imposed by the cylindrical tree trunk, they are very true to form although the characteristic features may be unduly accentuated.

The most artistic piece of work,



KITWANKOOL, FROM CENTER OF VILLAGE LOOKING NORTH

Kitwankool ("People among the Narrows," from its location at the entrance of a narrow valley between steep hills) is the most primitive of Kitikshan villages, owing to its isolated inland position between the Skeena and the Nass rivers and the unfriendly attitude of the inhabitants toward strangers. The villagers have uniformly resented the attempts of whites to settle in their midst and have refused to accept any reservation at the hands of the government. Today, with changed economic conditions, the scarcity of game and of fish and the necessity to seek work in other fields, the village is practically deserted except during the winter, when the people return en masse to celebrate the death feast and the potlatch. At such times the old house walls resound with the beat of the drum and the weird chants that tell of the glory of the past and the hero deeds of ancestors whose exploits are recorded on the totem poles



KITWANKOOL FROM NORTH END OF VILLAGE, LOOKING SOUTH AND EAST

Kitwankool, which lies to the west of Kitwanger and other river settlements of the Kitikshan, consists of a long row of typical old communal houses, gray, somber, and weathered. In front of these, standing at all angles, is a most wonderful forest of elaborately carved, slender totem poles, some of which show traces of color while others are moss-covered. These poles stand out against a background of deep green spruces and distant snow-capped mountains, making a picture that few have seen and none, having seen, could forget.

Among the poles of this village is that on which is represented the figure of a man seated on a chest containing his ashes. This curious effigy, of which a nearer view is presented on page 36, is seen in its larger setting, in the above photograph. The height of the pole may be visualized by the fact that the effigy itself is some ten feet above the ground.



THE MEDICINE MAN

While missions and schools have wrought great changes in the life and habits of the Kitikshan, yet the superstitions of the past still hold in thrall some of the older people, and the practice of the shaman has not entirely disappeared. The care of wounds and simple complaints was understood, and such minor afflictions were treated by older women with simple remedies, but severe and continued sickness was attributed to evil spirits that entered the body and stole the spirit—the essence of life—without which the body must die, or to the action of those who possessed witch power.

The shaman was relied upon to capture and restore the escaped spirit, or to detect the witch. Individuals of either sex might be shamans. The dress of a shaman consisted of a waist robe or apron, a small square of black-bear skin on the back, a crown of brown-bear claws or rope of woven red-cedar bark, a neck charm of bone, and finally a globular rattle of wood.



KUN-LAK-GEHLT AND HER DAUGHTER

The ceremonial dress of the Kitikshan was much the same for both sexes, and was that of the other Tsimshian and coast people. It is traditionally believed that the blanket woven of the wool of the mountain goat originated with the Tsimshian, but as far back as 1880 no evidence of its manufacture could be found among this people. The waist robe, originally of deerskin, was later made of a blanket and ornamented with puffin bills and the dew-hoofs of deer. The headdress, *Amhaloid*, with the small wooden mask in front generally representing the family crest, was the insignia of the chief and was highly valued. The older woman in ceremonial attire is a chief, the younger woman similarly clad is her daughter.

The primitive garb of the woman of the Northwest Coast north of Vancouver Island was a blanket robe of sea otter, marmot, or other smaller fur-bearing animals, or of dressed caribou or deerskin. With the advent of traders, wool blankets took the place of furs, and then followed cotton dresses



At Kitzegukla, on a totem pole that in other respects is not remarkable for its carvings, appears this exquisite figure of a grouse and her young,—one of the best examples of Kitikshan art. Note the dog, with a pack fastened on his back

faithful to nature in every detail, is that representing a grouse and her young as if suddenly startled, on an otherwise crude pole at Kitzegukla. The most natural figures are those completely carved on top of the poles, for all of the others are more or less in relief as they are merged at the back of the pole,—a rounded tree trunk or one hollowed out to decrease the weight in handling. A very interesting pole at Old Kitzegukla, with four figures, one above the other, tells four stories that are totemic or otherwise connected with the early history of the Kish-hasht clan, when all of the Kitikshan lived together at Tumlaham.

Of the Great Horned Owl (*Gweek-gwu-nook*), which is represented at the base, there are many legends, relating principally to the theft of children. One of these tells how in the winter season, when the great barnlike communal houses were untenable, and the people had moved into low, log, moss-chinked shelters, a little boy kept the household awake with his crying until the father said that the Great Owl would get him if he did not stop, and after a little the door was heard to open and close, when quiet reigned. In the morning the child was missing but the crying voice was heard as if in the distance. The father took his bow and arrows and went in search and, as he followed the trail, a Grouse flew up. He was about to shoot it when it said, "Do not shoot and I will tell you of your lost boy, but first paint red about my eyes." This he did (which accounts for the color which ever since has marked the Grouse) and the bird said: "How nice I look! Now go right ahead to the Owl's nest in the big spruce and you will find your boy." The father did as he was told, but the Owl had fed the little boy on snakes

and frogs that in turn had eaten through his stomach so that he shortly died. In the fall of the year the Owl, appearing as an old woman, came to the crossing of the river and was recognized through singing of the lost child. The father told the children, who were playing on the bridge, to remove some boards and lay dead sticks in their place. Then they called to the Owl to cross and, in attempting to do so, she fell into the river and was drowned.

The figure immediately above the Owl represents Pighish (the Property Woman), a mythical being, part human and in a way associated with the Land Otter. She carries a crying child on her back. Only one without fault is able to see her, and when the crying is heard, he must follow as the sun goes around four times, and coming to her, must seize the child. Thereupon the mother will plead for its return, agreeing to grant any wish, or with her copper-armed nails she will scratch his face; the preservation of the healed flesh brings great wealth to the possessor. This legend is known up and down the coast and in early days a member of the family obtained great riches from a meeting with this being.

Next in order is a small figure holding a bucket within a circle representing the sun. This tells the story of Kuke-shan, a child of the sun, a great moose hunter, who was ever thirsty. He traveled always at great speed for long distances, hunting moose, but he took only the paunch and the blood that was boiled down to a thick broth, and when he returned, his wife had many baskets full of water that he emptied immediately. Once she neglected to fill the baskets and, as he returned, she heard him shouting for water. In her confusion she answered "No water" and, grabbing the baskets,



A totem pole at Old Kitsegukla, the carvings of which tell in ascending order the stories of the Great Horned Owl, of the Property Woman, of Kuke-shan, who, a child of the sun, is shown within the great disk, and of the Mountain Goat

ran to the spring. But without water he could not live on earth and was at

once carried up to the sun, where he stands with his bucket of blood, which he spills on those who look at him, causing fatal sickness.

The last figure is that of the Mountain Goat and illustrates one of the oldest of the family legends. Across the river from Tumlaham is an isolated precipitous mountain known as Steep Sides, where in the fall after the salmon season the Indians hunted the Mountain Goat. The flesh was eaten, the heavy pelt served for bedding, the fine wool was spun into a thread and woven into blankets, the horns were fashioned into spoons, and the heavy leaf fat melted and run into cakes for winter food. One fall a young hunter after killing many goats caught a kid and, taking the red paint with which he used to color his arrow for good luck, painted the horns and face of the kid to honor it. Thereupon he set it free. The following spring two strangers, dressed in white blankets, appeared in the village and, as was the custom, were entertained by the chief. At the feast, when dried salmon, goat's meat, and dried berries were placed before them, they made no attempt to eat, but after they had left, some children playing beyond the village saw them on their hands and knees eating grass like animals.

Their purpose in coming was to invite the people to visit them but without giving the location of the village to which they offered to guide them. The following morning the villagers assembled and, led by their visitors, crossed the river. Ascending the mountain, they reached what appeared to them to be a broad expanse, with large feast houses and many people all in white robes. But this was all a delusion. They were under the spell of the mountain. The

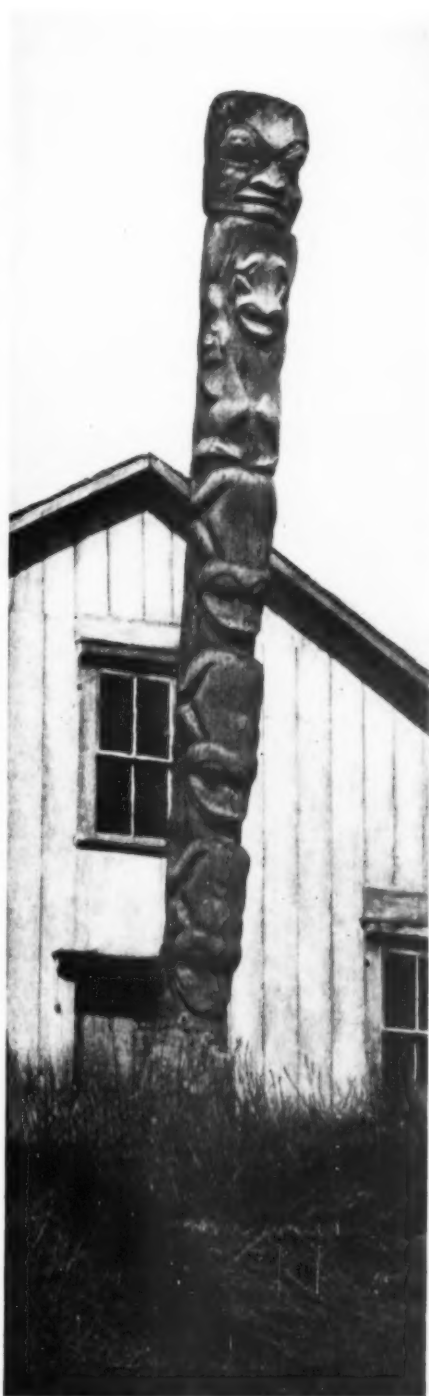
broad expanse was a narrow rock shelf; over the precipitous sides were platforms of broad planks and the white-clad villagers were Mountain Goats. After the feast the hosts began a weird dance and sang: "I am shaking my hoofs over the mountain-side," and the people saw the rocks open and close, and were puzzled.

When night came, they were given sleeping places on the outer portion of the platforms while their hosts took the inner side, all except the hunter who the previous year had caught and painted the kid. To him came a young man whose face was painted in red, and asked him to share his sleeping place with him, which was next to the wall. During the night the Goat hosts pushed all of their sleeping guests off into space and they were killed. When the young hunter arose, his friend took off his own boots, which appeared as hoofs, and told the hunter to put them on, for then he would be able to descend the steep shelves by jumping from one to another without fear. When the Indian youth reached the plain below, he found the crushed remains of all of his friends, and in this way the Goat people had avenged the death of their people by the hunters.

The legend of a chief's daughter who was carried away by the Frog lover is common to the whole Northwest Coast and is told here as elsewhere. *Le-gam-ksh*, the daughter of the chief of the *Kan-ha-da*, at *Kitwankool*, was strictly guarded, as was the custom among the aristocracy, but it became known that a strange young man had been seen with her for several nights. No trace of him could be found in the morning, only a little frog was noticed in the house. Later the daughter was missing, and the only trace discoverable was her footprints, leading to a near-by

spring. Some years later two little Frogs appeared at the door of the house, croaking very loudly. The chief wanted to know what was their trouble, but no one could tell until an old woman who understood the Frog language was found. She said that their mother had sent them to borrow an awl for use in sewing moccasins. This was given them, also some sinew thread, and as they left, they were followed to the very spring to which the lost daughter's trail led so many years before. So the chief knew that she was still alive and sojourning with the Frog people and he proposed to drain the spring to recover her. A ditch was dug but it was found, as the course of the water was followed, that it led to a lake far beyond. The Indians kept on and, when they reached the lake and the water commenced to fall, the Frog people begged the woman to loosen her hair and float down the stream, and they all clung to her and her flowing hair, singing the family death chant. The totem pole representing the figure of a woman with Frogs on it and three Frogs below illustrates and perpetuates this happening in the early life of the family.

At the northern end of the village of Kispiox is a tall pole of the Lagh-Ke-boo clan, representing at the top the Bald Eagle of the coast holding a human figure by the head, and below four other figures each grasping the legs of the one above. Coming out of the base of the pole is the forebody of the Bear, the emblem of the clan. This is purely a story pole illustrating the adventures of Gwa-skeek, which is likewise the name of the pole. Gwa-skeek was a gambler and in play lost everything to an opponent. Then he went into the woods and during his wandering came to a salmon stream



This totem pole serves to recall a myth common to the entire Northwest Coast, namely, that of the elopement of a chief's daughter with her Frog lover



Gwa-skeek, enveloped by the skin of the Bald Eagle, is shown at the top of the pole with wings spread in flight, bearing seaward the five victims of his revenge. Near the base of the pole protrudes the body of the Bear, an emblem of the Lagh-ke-boo clan

and, when he took the fish, their scales turned into the valuable coppers. Throughout the three years he lived there, he ate the bark of the devil's-club to bring him luck, and then, doing up the coppers in bundles, he returned to his village and challenged his former opponent to play again, finally winning

all his belongings. But before he could leave, the whole family of his opponent turned against him, made him fast to a plank with spruce gum, and pushed it out in the water. He drifted about for some time but finally grounded in front of a strange village.

The chief had him brought ashore and tried to release him from the plank but to no avail until seal oil was used. Then, free, he became the chief's guest. Early every morning one of the household would rise, put on the skin of an Eagle that was hanging on the wall, and flying up through the smoke would go out to sea and catch a seal, which was shared by all of the villagers. Then the chief said to his guest: "It is your turn to provide a seal, but when you fasten to it, do not try to rise, but let it take you down under the water at first." Gwa-skeek was successful.

After Gwa-skeek had practiced sufficiently, the chief told him to get into the Eagle skin and to go to the village of those who would have killed him, but to act cautiously and to seek the chief, the uncle of the one with whom he had gambled, and, when he had seized him by the head, to rise very slowly. This Gwa-skeek did and, as the chief was lifted from the ground, one of the nephews caught hold of his feet and then in turn each of the other three nephews caught hold of the one above until the Eagle man rose with all five and, flying out to sea, dropped all into the water, drowning them.

About the middle of the village of Kispiox is a house of the Lagh-ke-boo clan, with a round hole over the doorway, and directly in front is a carved pole showing a human figure at the base, above it a round hole with four small figures, then a standing figure of a man, above which is a Wolf, and finally another Wolf, the clan emblem,

surmounts the pole. The crude human figures are named Weden-ba-bah (legs apart). The designation of the pole is Wil-na kak (through the hole). This pole illustrates the story of a man, Ye-a, who with his family was camping by a lake in the valley above the village. The Beaver people captured and drew him into the lake, where he was found by his three sons and his daughter. When he saw his children, he commenced to cry. They pushed some small trees out to him, but instead of taking hold of them, he would turn and dive and, as he went down, his flat beaver tail would strike the water with a great splash, and he would come up farther out. He told them that he could never come home again but would always live with the Beaver people. So the family took the Beaver for emblem and entered their house, just as the Beaver does, through a round hole. When a potlatch was given by this household some years ago, the guests entered the house through the round hole above the door as if going into a beaver's hutch. The round hole on the pole represents the entrance to the Beaver's house and the four small figures the four children of the lost father.

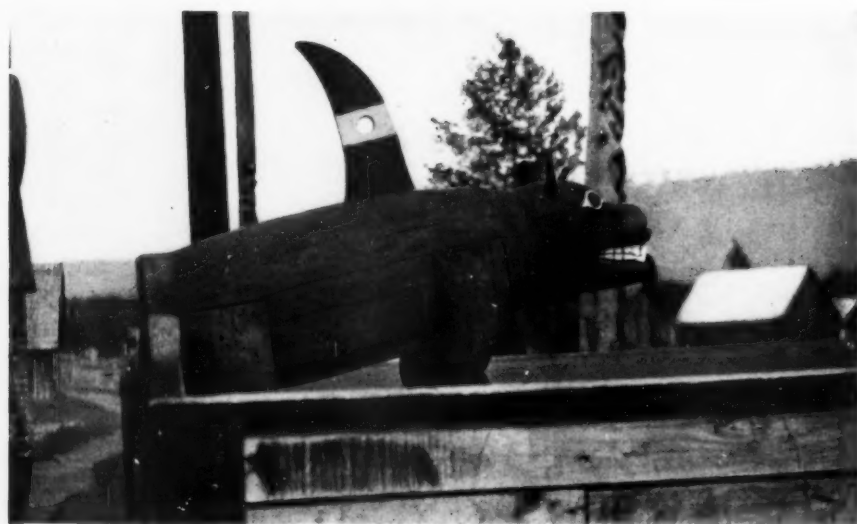
With the totem poles on the farther side of the roadway in front of the houses crest figures are placed on platforms. At Kispiox, before the house of the Kish-hash chief, is a distinctive house-crest pole representing a mythical Snake of great size that was taken by a member of the family in early days after it had killed many of the people; and on either side of it are two well carved and painted figures representing a Killer Whale and the mythical Bear under Water. A large painted figure of this Bear resting on a raised platform, appears in front of another house located about the middle of Kispiox.



This pole tells the story of a man who was captured by the Beaver people and made one of them. His descendants adopted the Beaver as their emblem and some years ago, when the family gave a potlatch, the guests crawled into the dwelling through the round hole above the doorway as though they were entering a beaver hutch.

The head and forepaws are those of the Bear; the high dorsal fin is that of the Whale.

In the village of Kitwangach on a raised platform is a very remarkable animal figure known as How-how, a



In the upper picture, taken at the village of Kispiox, are shown two crest figures carved in wood, flanking a pole representing a mythical Snake. The figure on the left represents the Killer Whale, that on the right the mythical Grizzly Bear under Water, a marine monster. In front of another house in Kispiox is the figure shown in the lower photograph. Its head and forepaws are those of the Grizzly Bear under Water but the upthrust dorsal fin, perforated with a circular hole, is that of the Killer Whale

creature that after terrorizing a portion of the river was finally killed by a member of a family of this village and hence became a family crest. It

resembles no animal known to this section but, judging by the tail, might be a mountain lion that had wandered over the mountains to the coast.

The Night Chant

AS REPRESENTED IN THE NEW NAVAJO GROUP AT
THE AMERICAN MUSEUM

By P. E. GODDARD

Curator of Ethnology, American Museum

THE third of the series of "habitat groups" in the Southwest Indian hall was opened with a reception on Wednesday afternoon, the nineteenth of November. This group represents certain phases of the life of the Navajo, the largest tribe of full-blood Indians in the United States, numbering 30,000 individuals.

There have been Catholic churches and missionaries in the Southwest since 1610 and Protestant missionaries for the past fifty years at least, but until recently the Navajo remained unaffected. Even now the great majority is untouched by direct Christianity. For them the forces of nature are powerful and endowed with personality. The sun, lightning, mirage, rain-clouds, rainbows, and winds are the subject of song and are addressed in prayer. In addition there are personal divinities with definite names and attributes. These gods and goddesses in former days visited the Navajo whenever they could be of assistance to them and came also to join in their festivities. Times have changed, and now Navajo men wear masks to represent these gods, but they represent them as a viceroy would a king. For the time being the masked man has some of the powers and personality of the god himself.

Religious activities among the Navajo are mostly systematized into definite ceremonies lasting nine days. Each of these has a long myth telling how the songs, prayers, and rites of the ceremony were learned from the

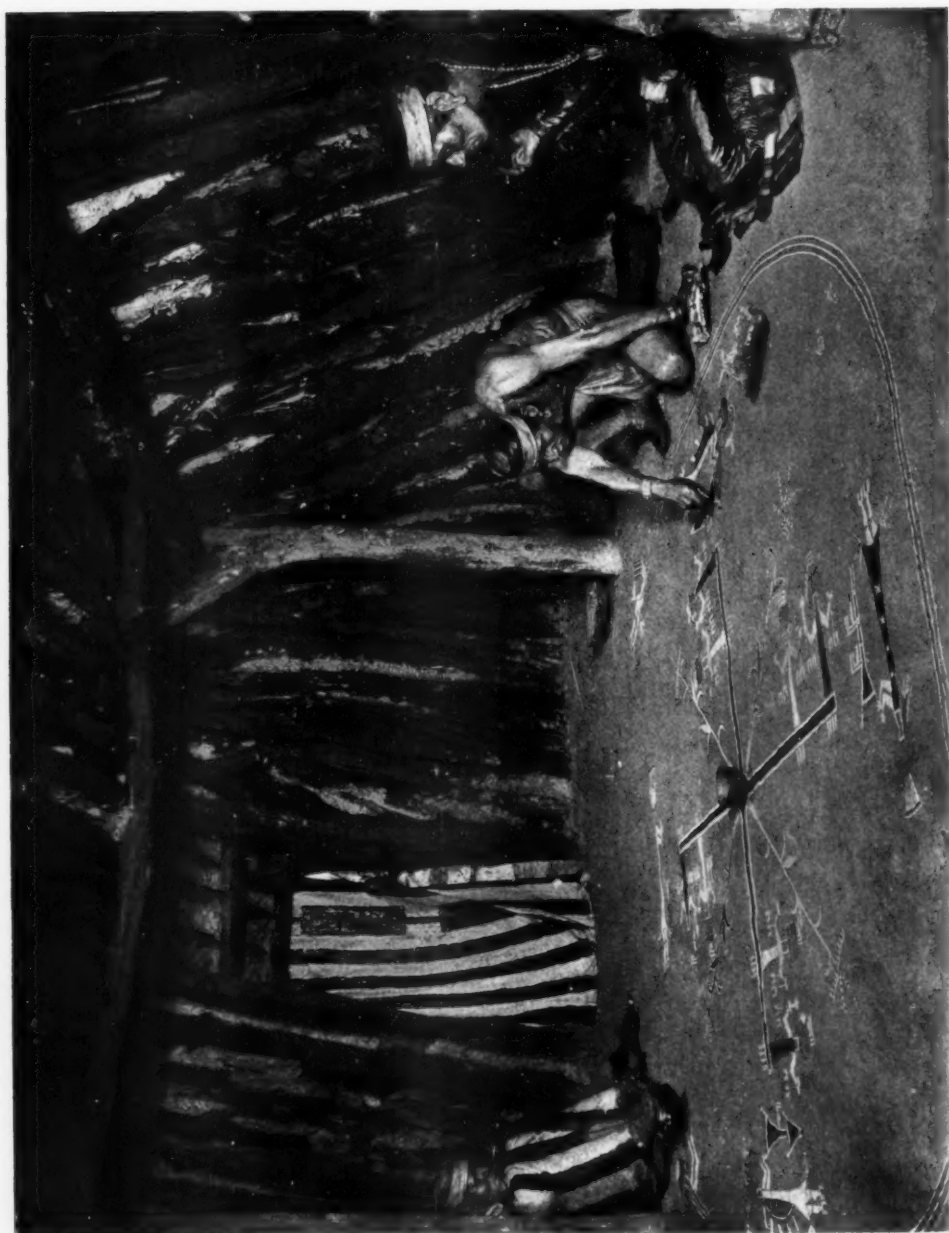
supernatural ones after many and long journeys made to their abodes by a traveler ages ago. This information is passed down from the master or priest to disciples, who learn by receiving oral instruction and by assisting in the ceremonies. Such a ceremony is held for a sick or ailing individual, who pays the priest and his assistants and feeds all those who help in the rites or attend as spectators.

Viewed from another angle, however, the ceremonies appear as art as well as religion. The mythical narratives have high literary value, characterized as they are by vivid descriptions and much human interest. The songs and prayers use repetition to produce symmetry and balance, and they abound in figures of speech and imagery. The masked gods are actors who present the dramas of the golden age when gods and men mingled freely. In the medicine lodge many elaborate paintings are laid on the floor, by sprinkling powdered materials of the required colors. These pictures also portray supernatural events of mythical times generally connected with the origin of the ceremony. On the final night there is not only a drama in which the gods appear, but there is much rivalry in group dancing, clowns divert the audience, and magic is practised to entertain and impress the spectators.

To illustrate ceremonial life in the newly installed Museum group, the Night Chant was chosen. This is a favorite observance among the Navajo

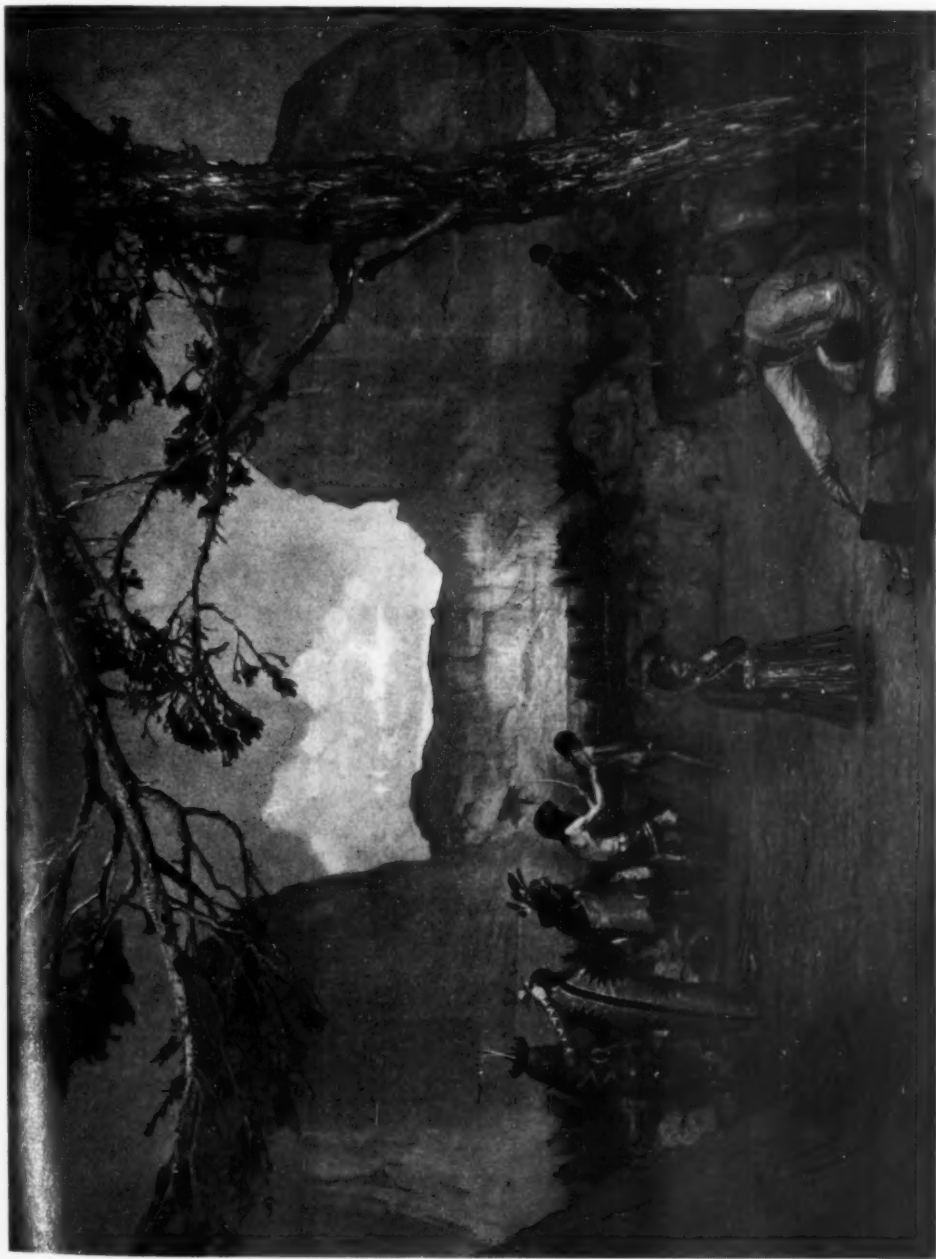
THE MEDICINE LODGE

Ceremonial paintings like that laid on the floor of the lodge must be completed in one day and removed by sundown. One of the Indians is shown putting the finishing touch on the medicine bag carried by a Hunchback God. Just beyond the opposite arm of the cross is seen another Hunchback God. The House God is represented in the extreme foreground, and the corresponding figure seen faintly between the far arm of the cross and the blanket-covered doorway is the Talking God. Other gods and goddesses are seated on the cross itself. The bowl in the center represents a bottomless lake



THE SCENE OUTSIDE
OF THE LODGE

The patient for whose healing the painting in the lodge has been made, is seen to the left enveloped in a blanket. Behind him is the god Fringe Mouth shaking his rattle to drive out the disease. The naked youth in the background is a novice undergoing an initiation rite. At the moment, he is being whipped by a goddess, after which the Talking God, standing close by, will sprinkle him with corn meal. Characteristic features of the pastoral life of these Indians are seen to the right of the group, while the costumes and silver ornaments of the figures in the foreground illustrate present-day dress



and the necessary information was available in a Memoir of the Museum written by Dr. Washington Matthews, who learned much of the ceremony and was recognized by the Navajo as a priest of the rite. A panel divides the group into two sections: a medicine lodge with its interior exposed is on the left, and a scene outside of the lodge is depicted on the right. Two ceremonial events are shown in this open-air scene. Just outside of the medicine lodge stands the patient and behind him one of the gods, Fringe Mouth. This diety, dressed and painted according to the ritual, is driving away the disease with the aid of a rattle. In the background a youth is being initiated. Until this time he is not supposed to know that those appearing as gods are not the real supernatural beings. He is whipped by a goddess and then is sprinkled with corn meal by the Talking God, the dean of the divinities, who is standing close by. After this, one of the gods unmasks that the novice may see that he is only a Navajo acquaintance.

It is in the medicine lodge that the more important events take place. Here the dry paintings are made on several different days. Each painting must be completed in one day and removed by sundown. The painting shown in this group represents two logs in the form of a cross whirling sunwise on a bottomless lake. This lake is supposed to be near the place where the San Juan River joins the Colorado. The lake itself is represented by a bowl of water in the center. From this four corn stalks grow out in the angles formed by the logs. These corn plants are painted in the four colors which the Navajo associate with the world quarters: white with the east, blue with the south, yellow

with the west, and black with the north.

Sitting on the ends of each arm of the cross are pairs of gods and beyond the ends are other divinities, one for each point of the compass. At the east, near the blanketed exit of the lodge, is the Talking God carrying a squirrel skin as his medicine bag. Opposite, at the west, is the House God, the constant companion of the former. At the other ends, north and south, are Hunchback Gods, associated particularly with mountain sheep. Almost completely surrounding the picture is a Rainbow Goddess, on whose hand has been set a vessel containing a medicine.

There is a series of songs relating to this sand picture which must be sung over it. While the occasion for holding the ceremony is always the indisposition of an individual, blessings are sought for the entire community. The most important of these blessings are plentiful crops and sufficient pasturage, which are dependent on frequent rains. Hence rain is the thing asked for in the songs. Health and general prosperity are also sought by the vocal songs and prayers, the dry paintings, enacted dramas, and pantomime.

When the picture is completed, the patient is seated on the painting and parts of it are applied to him for his healing. Other individuals may help themselves to what remains and the residue is carried out and properly disposed of.

While the ceremonies of the Night Chant are of principal interest in the group, other phases of Navajo life are included. Their pastoral pursuits are suggested by the sheep that are being driven from the dance ground by a young woman and her dog. The

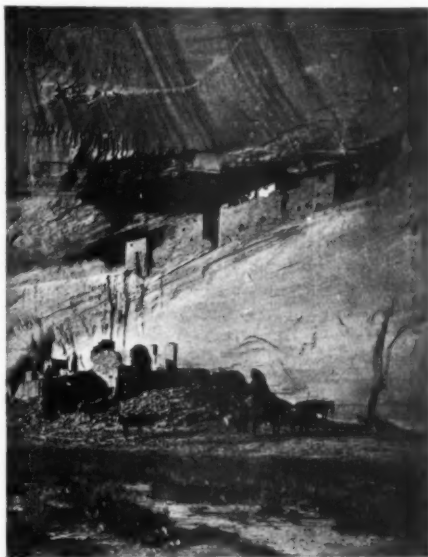
Navajo women own the sheep and, with the help of the children of both sexes, herd them. Goats usually run with the sheep, partly as a protection against coyotes, which they fight off, and as a source of meat that does not reduce the supply of wool. The horsemanship of the Navajo and the type of their horses is shown at the extreme left beyond the range of the illustration. The costumes of the figures, particularly those in the foreground, with their colored velveteen upper garments and their silver ornaments, illustrate present-day dress, while the Navajo blanket appears both in the indoor and outdoor scenes.

The setting chosen is Cañon de Chelly in the heart of the Navajo country. The walls of this cañon reach a height of eight hundred feet in places and are of red sandstone beautifully shaded and here and there deeply stained. White House, a noted cliff ruin, is included in the painted background but beyond the angle of the lens. It was in this cliff house that many of the rites of the Night Chant were imparted by the gods to the Navajo who, it is believed, introduced the ceremony.

Howard McCormick painted the landscape, arranged the setting, and had oversight of the lighting and the many details of the construction. Mahonri M. Young, from notes and studies made in the Navajo country, modeled the human figures, colored them, and arranged their spacing and grouping.

In addition to the expert work of the department of preparation, in carrying out the larger features as well as in making and placing the vegetation and

accessories, the execution of such a group requires the aid of many skilled workers belonging to the Museum's forces: carpenters, plasterers, painters, metal workers, and electricians. All the work must be done in full coöperation with the artists, who also must collaborate in order to produce a



THE WHITE HOUSE OF CAÑON
DE CHELLY

Of white dawn the house is made and of
yellow twilight,
Of dark cloud the house is made and of male
rain,
Of dark mist the house is made and of female
rain,
Of grasshoppers and fertile pollen;
Where dark mist watches the door
And rainbow's trail is the road,
Where high stands the jagged lightning,
Where high stands the male rain.

picture all of the elements of which, whether faithful rendering or artful illusion, give the spectator the feeling of witnessing Navajo life in the Navajo country.

A Bird Trickster Outwitted

HOW THE YELLOW WARBLER CIRCUMVENTS THE COWBIRD

By CHARLES MACNAMARA

ONE of the most widely known facts of natural history is that the European cuckoo never builds a nest of its own, but deposits its eggs in the nests of other birds, there to be hatched, the young cuckoo throwing out the legitimate nestlings to perish on the ground so that it may enjoy the whole of the food supplied by the infatuated and unsuspecting foster parents. This parasitic habit is not confined to one species; it is practised by most, if not all, of the cuckoo family of the Old World. But, with the exception of a little-known South American species, it does not extend to the cuckoos of the New World, and the two species that reside in eastern North America in summer build nests for themselves—albeit very poor ones—and virtuously rear their own young. Nevertheless, our bird population is not without its cheats. In this country the cowbirds, cousins of the American blackbirds and the starlings, and totally unrelated to the cuckoos, have hit on the same disreputable plan as the Old World cuckoos for avoiding the cares and anxieties of parenthood.

Cowbirds are found in both North and South America, and their habits appear to be much the same on both continents. The best-known species is *Molothrus ater*, common in summer time in the pastures of the Eastern States and Canada. It usually feeds on the ground in small flocks among the horses and cattle, whence it derives its popular name. It is a stoutly-built thick-beaked bird about four-fifths the size of a robin. The male is glossy black

with coffee-brown head, neck, and breast, while the female is ashen brown, darker on the back and lighter beneath. Our cowbird doubtless accompanies the cattle for the sake of the insects that the tramping of the animals disturbs from the sod, and for the flies and other pests that always frequent a herd. In *The Voyage of the Beagle* Darwin describes the same habit as evidenced in another species, *Molothrus niger*, on the plains of Uruguay. North American Cowbirds followed the buffalo herds on the great plains, and before the white man cleared the forests and introduced cattle, they were probably scarce in the eastern woodlands, although a few of them may have frequented swampy places, where they are sometimes still to be found associating with red-winged blackbirds.

From the fact that several females are often seen flying around with one male, it is supposed that cowbirds are polygamous. As they build no nests, but deposit their eggs in the nests of others, there is no particular need for them to pair. It is curious to see a female cowbird looking for a nest in which to lay. One day last summer I was sitting on the veranda of my home in this little Ontario town,¹ when I caught a glimpse of an unfamiliar bird in the maple tree before the door. I was pretty well acquainted with all the birds living along our street: robins, wrens, vireos, warblers, sparrows, phœbes, and others, but this was none of them. A second better view showed

¹Arnprior, regarding the bird life of which Mr. Macnamara contributed an article to the issue of NATURAL HISTORY for May-June, 1923.

it to be a gray-brown female cowbird that was a long way from her usual beat. Her actions were amusing. As she hopped from branch to branch, craning her neck and turning her head, no screen actress could have better "registered" an anxious search. Most manifestly she was looking eagerly for

nest, the cowbird follows a different practice. It monopolizes all the food, and causes the death of the other nestlings by starvation, and long after it has left the nest and could easily fend for itself, it continues to follow its poor dupes around and importune them for food. A small neat chipping



Photograph by G. Clyde Fisher

Before the white man's cattle took over the grazing lands of the bison, the cowbird (*Molothrus ater*) was the buffalo bird, being found often in company with this animal. The above picture, taken at Bronx Park, indicates that the ancient association is easily reestablished

something, the something being, of course, a bird's nest. I lost sight of her in the next tree, and although there were many birds nesting in the vicinity, apparently she found no suitable place anywhere near to deposit her white egg with the brown speckles, for I did not subsequently see a young cowbird in our neighborhood. And a young cowbird is always conspicuous: the difference in size and appearance between it and its foster parents is usually very striking. While the cuckoo actually throws the rightful young out of the

sparrow devotedly feeding a large gawky young cowbird is a pathetic sight. Apparently cowbirds never lay more than one egg in the same nest. Instinct tells them that one of their young is all that any pair of birds can attend to at a time.

Cowbirds impose on many different birds, mostly those smaller than themselves, but it is said that even species as large as towhees and kingbirds do not escape the infliction. Vireos and chipping sparrows are perhaps the most frequent victims. But although most



Photograph by Arthur A. Allen

A yellow warbler (*Dendroica aestiva*) on its nest

species accept the changeling egg without hesitation, there is one bird that often detects the fraud and has devised an ingenious way of circumventing the impostor. This is the yellow warbler, *Dendroica aestiva*. With his greenish-yellow mate, this dapper little bright-yellow bird usually builds in a shrub a few feet from the ground. The nest is well constructed of fine roots, withered grass, horse and cow hair, and shreds of fibrous bark, with an inevitable trimming of down from poplar or willow catkins. The normal nest is about three inches high, but once in a while you come across one

that is noticeably taller, measuring perhaps four or five inches in height. Investigation will show that the cup of this nest is no deeper than usual, and that the additional height is made up of an extra thickness in the bottom. If you probe into this heavy base, you are almost sure to find a cowbird's egg embedded in it. The warblers, returning some fine day and discovering a strange repulsive egg in their little home, disposed of it by the elaborate method of building another story to their nest, and burying the unwanted egg in the basement, sometimes even immuring part of their own clutch at

the same time. If after a first egg is thus disposed of, another one is laid in the nest, the operation may be repeated. The second egg is covered over as was the first, and the walls of the nest are again raised.

that not one egg but two were buried in its base. The white shells are discolored and the brown speckles on them have turned black, but the eggs are unmistakably those of a cowbird.

Why the warblers do not simply



Photograph by Charles Macnamara

A yellow warbler's nest found in a garden at Arnprior, Ontario.—It was built of typical materials, but was nearly twice as high as the ordinary nest of this bird. Photograph about one-half natural size.

Such a nest is shown in the accompanying photographs. It was found during the winter in a barberry bush by Liguori Gormley of Arnprior, Ontario, a keen bird student, who, noticing the unusual height of the nest—about five inches—suspected that it enclosed a cowbird's egg. On parting the fibers in the bottom, he discovered the upper egg, and kindly brought the nest to me. After photographing it intact as it was collected, I sectioned it with a razor, and was surprised to find



Photograph by Charles Macnamara

A vertical section of the yellow warbler's nest shown intact in the photograph on the left. The extra height is in the base of the nest, in which two eggs of the cowbird are embedded

throw the intruding egg overboard it is hard to say. It cannot be that they are too small. The house wren is smaller than the yellow warbler, yet it readily empties a nest of eggs, and even of young birds. The warbler's method is curiously indirect and seems to us to involve much needless work. But then they have no efficiency experts to teach them how to avoid unnecessary motions, and the course they take, however devious, must be the line of least resistance for them.

Dogs of the Labrador Indians¹

By FRANK G. SPECK

Professor of Anthropology, University of Pennsylvania

MUCH attention has been directed to the use of dogs for transportation in the Arctic and Antarctic regions. The Eskimos have long been regarded as the originators of dog transportation in North America; but the question of the

Montagnais and Naskapi, comprising a total of about 3000 individuals, whose hunting grounds range between James Bay and the Gulf of St. Lawrence. For a number of years I have been engaged in research work among these tribes, undertaken on behalf of various museums.

There rests in my mind little doubt now, after a survey of its distribution, that not only the practice of using dogs for transport in winter, but to a large extent even the dog stock itself, have been derived by the Montagnais of the southern part of the peninsula, through contact with the French Canadians. If this conclusion is correct, it warrants the assumption, to which the situation existing in other Algonkian groups lends color, that the earlier ancestors of the present tribes did not have suitable animals for hauling before the time of their contact with the dog-driving Eskimos in the Hudson Bay and the Labrador region, and later with the Canadians in the St. Lawrence area. We may, however, leave this assumption to become more evident as the variations and innovations of dog utilization are indicated farther on in the article.

The Montagnais have several types of dog. First to be mentioned is a small, decidedly vulpine race: the prominent, pointed, up-standing ears, the pointed nose, the silky hair, and whitish belly are characteristic. In color, dogs of this race are brown, reddish, or white and gray. They have a light delicate step, a trim graceful figure, and an amiable disposition. *Mahì-*



A typical hunting dog of the Montagnais

origin of similar practices among the Indians of the Far North has not been previously approached. This statement applies particularly to the tribes of the Labrador peninsula, who use dogs extensively for the transportation of their valuable cargoes of fur and provisions in their winter wanderings. A recent study of the institution of dog-driving among these tribes has led to the conclusions herein presented. The tribes dealt with are those speaking Algonkian languages and known respectively as the Mon-

¹Photographs, with the exception of those noted, by the author.



Montagnais hunters and members of their families at Lake St. John, with a sled dog and two hunting dogs.—When puppies are born, a method of ascertaining whether they will become good forward trailers is to lift them up by one ear. If the puppy thus tested cries, it is a bad sign. If he is quiet, the Indians feel confident that he will become a good hunter.

The names borne by these hunting dogs are often interesting. They furnish a registry illustrative of an unquestionably early stage of native culture: *Negwutsac*, "Squirrel," applied to a handsome little beast of hardly fifteen pounds, with delicate legs and a light chestnut-brown hue; *Shojo*, which seems to have no meaning; *Ntòhum*, "My Hunter"; *Kawàbchit*, "Whitey"; *Tantè*, "Where?"; and the like

kan atùm, "wolf-dog," is the term by which they are known among the Indians of the Lake St. John and the Gulf of St. Lawrence region. These, considered the real Indian dogs, undoubtedly represent the original strain. They serve only as trailers, for their scent being keen and their actions quick, they make excellent, intelligent hunters. The hunting dog constitutes a decided type, one that appeals to human interest because of its historical background as well as through its individuality. About thirty years ago there were no dogs other than these among the Lake St. John Indians, and they did not "train." The toboggans were drawn by the

men, dogs running alongside or behind, constantly on the alert for the scent of game.

When, in traveling, these dogs scent the tracks of game, they are off after the animal, quietly taking the trail unless it is very fresh, in which case they yelp and howl. It is then that the big sled-dogs make an uproar. Often the latter have to be quieted by force, even having their mouths tied shut with thongs.

The driving animals, in contrast to the breed just described, are ordinarily big hardy beasts, with broad heads and short hair. Usually their features indicate affinity with the European dog races, but occasionally some mix-

ture with the Eskimo husky is evident. This infusion is not surprising, for we know that trade with the more remote Indians, the Naskapi or "heathen," who are in direct contact with the Eskimos, has brought the husky



A Naskapi husky at Seven Islands, Gulf of St. Lawrence

breed into the interior among the Montagnais. I have seen on several occasions true types of the Eskimo breed of dog tied up near the camps and houses of the Lake St. John band, some of which had been brought in by Chief Joseph Kurtness. Some of the sled dogs, of "train" dogs, as we

may call them from the common French term *chiens qui trainent*, show a wolf strain in their bushy tail, long muzzle, oblique eyes, and savage disposition. The large train dogs are known in the native tongue as *mistâ-tum*, "big dog."

The breed of dogs used for sled-driving by the Montagnais of Lake St. John and from there to the St. Lawrence and eastward generally as far as Seven Islands, is a mongrel shaggy beast, prevailingly dark brown, of a rusty, worn hue, or black, with a slight admixture of white.

There is a great difference between the train dogs of the Lake St. John Indians and those of Lake Mistassini. At the latter post the animals are almost of the pure husky type, and the technique employed in harnessing and driving them is strictly Eskimoan. Here the four or five animals are harnessed by the leather strap loop over the neck and shoulders, one dog before the other. The lead dog is master of the team; the driver uses a whip to guide the animals, and the commands are the same as those used by the Labrador Eskimos (*huît*, go; *â*, stop; *aug*, right; *rr*, left). The Mistassini



Photograph by W. H. Hauser

When these puppies grow up, they, in their turn, will pull the laden sleds of the Naskapi. The picture was taken at Seven Islands



Photograph by J. G. Rousseau

A dog team of the Naskapi at Seven Islands.—The built-up sled, which is coming into more general use along the trade paths in place of the toboggan, is shown in this photograph

people, who are one of the divisions of the Naskapi, employ the toboggan for dog transportation, not the built-up sled of the Montagnais. The latter has more resemblances to the sled of both Eskimos and Canadians. The Mistassini carry on some trade in dogs with the other bands, getting not less than thirty dollars for an adult animal. Chief Kurtness, of the Lake St. John tribe, some years ago secured two puppies from Mistassini Indians, paying twenty-two dollars for them.

As an instance of what these fine animals are expected to do, the chief just alluded to on one occasion came down from Lake Chibougamou with two dogs and provisions enough for man and beasts. On the way he gathered from traps two lynxes and two foxes weighing an additional one hundred pounds. He left Chibougamou at 7 A.M., stopped and camped at 2 P.M., left camp the next morning before 6 A.M., stopped again at 2 P.M., started the third morning at about 7

A.M., and arrived at Lake St. John late that afternoon, a distance of almost two hundred miles. The huskies run for a while, then trot to rest themselves, taking each gait according to their own inclination. It is very hard to make them change pace when they do not want to. In short, dog-driving among the Mistassini people is a distinct Eskimo analogy, if not an outright acculturation.

As regards the technique of dog transportation among the Montagnais, on the other hand, an European origin is convincingly suggested not only by the breed of the large dogs and their individual names, but in many details of harnessing and management. The sleds consist of two side pieces, shod with wooden or iron runners and connected by rounds. A pair of shafts is bolted by rings to the front end of the side pieces, and between the shafts, tied firmly to them, is a stuffed leather collar. If two or more dogs are used, the front ones, arranged in tandem,



To break a path the Indian walks ahead of the dogs, treading on the soft snow with his broad rounded snowshoes of the Montagnais type

pull on traces attached to their collars. On the coast of the Gulf of St. Lawrence westward of Esquimaux Point this is the method of harnessing, but eastward on the entire coast the more Eskimo-like "span" attachment is found. Jenness attributest the tandem attachment wherever found, even among Eskimos, to European contact. The big dogs often appear with their tails cut off. The reason for this amputation is to prevent the driver being "hit" in the face when he rides close behind the beast. The words of command are given in Canadian French. *Pareille* means "turn left;" *icitte*, "turn right;" *hooo* (whoa), "stop;" and the universal *marche*, "go." The Athapascans of the Canadian Northwest use *marche* and *whoa* similarly, but *eun*, "right," and *ja*, "left."

When traveling in the bush on his constant wanderings, the Montagnais hunter usually runs ahead of the dogs to break the trail with snowshoes. The dogs go much better if there is a man ahead of them. In fact, even a little hunting dog keeping ahead of a

train dog will often prove such an incentive to the harnessed animal that he will do almost anything in his power either to reach the little one or keep him from gaining. Ordinarily a dog train on the move is anything but tranquility. The animals are constantly falling off the beaten track into soft snow, where they lie helpless until hauled out by the driver. When pulling through burnt country, which of course is very extensive in the high interior, they constantly become tangled, or get a leg over the shaft or line. This incites the driver to shouts and commands, which, however, seldom upset his sense of humor, provided he is not suffering from hunger. Hunger, I might add, is about the only misery of the bush life that cannot be met with good humor.

As the trail winds over hills, and through the openings of the spruces and balsams, the dogs tug away, suiting their pace to the going. Should a dog become over-tired on an upgrade or because the snow is too soft, he may lie down with an appealing look.

Such behavior, if the driver be not in sympathy with it, brings forth a yell of *lâche*, in the Canadian-French patois, "coward," and, if further incentive is necessary, a pelting with lumps of snow. So between untangling, trotting on the smooth good trails, tugging slowly on the grades or soft places, and occasional rests, the day passes. When a halt is made, the dogs stretch flat on their bellies and bury their muzzles in the snow. They eat snow quite frequently, this being, in fact, their only method of getting a drink. They are, nevertheless, no worse off than their masters in this respect, for in winter the Montagnais when in the bush obtain all their water by melting snow. This drink is referred to as *shishebanabui*.

When the grade is downward and the trail is smooth, the hunter may let his dogs pass him. Then quickly by a twist of the foot he will remove the wide rounded snowshoes of the Montagnais type, throw them on the load, and himself squat on the laden sled or toboggan, encouraging his dogs by "*Marche! marche da' toi!*" The bobbing brown bodies pulling in the trace, the crunch of the iron or wooden runners—wood being used in the spring when the snow is more soggy,—the thick bush gliding by at about eight or ten miles an hour contribute memorable impressions to one's life with the northern Indians.

Should it be necessary to pass another team on the trail, the moment is a critical one. The dogs of the two caravans, if not held in check, will engage in battle. By a tacit understanding one man leads his animals to one side, holding the lead dog by the collar. Then a curt command is given in French "*Passe!*" and with muffled growls, and bristles

erect, the dogs of each sled resume their way. Generally, if both the drivers are Indians, they stop and converse, but in either case, the dogs have to be held.

The feeding times are in the morning and evening, but sometimes, if food happens to be short, only an evening meal is supplied. The Lake St. John Indians do not feed their dogs frozen fish as do the Crees and Eskimos, for they have not an abundant supply. Whatever is left from the Indian repasts is given to the dogs. This is invariably meat and bone. To one unaccustomed to northern dog-wolves,



A Montagnais and his dogs resting on the trail

chien-loups as they are called by the "habitants," it is astonishing at first to observe the rapidity and apparent ease with which the beasts break up and swallow tough bones, bones being their favorite diet.

It is the general opinion among the Indians of this particular region that caribou bones make their dogs sick. They claim that these bones are indigestible. And yet I suspect the true objection is to be found in their superstition. It is their belief that the game animals are sensitive to ill-treatment of the parts left over after the flesh has been eaten. The spirits of the animals resent in particular the ignominy of seeing their bones fought over, crunched, and devoured by dogs, because the dog, an animal like themselves, has turned traitor to his kind and, living with man, aids him in following their traces and bringing them down. Accordingly, for a hunter to allow his dogs to eat the bones of game he has killed is regarded as a sure source of bad luck in his hunt. So all through the north one sees the bones of game animals treated with some form of regard. Especially are the skulls of the bear and beaver cleaned and hung up among the branches of a tree to satisfy the spirits of their kind, that they may be induced to continue the submission of their spirits to those of the hunters. Among these nomads the whole theory of success in life's pursuits, no matter what they may be, lies in a concept of soul conquest.

In the mythology of the north we find one interesting example of speculative theory as to how the dog came originally to be the companion of man

and so different in disposition from the wild creatures of the bush, who regard with feelings of terror both human beings and fire. Not among the Labrador tribes, however, but across the St. Lawrence in Maine, among the Penobscot, is the following version related: The mythical hero, whose name is translated as Deceiving Man, just before the appearance of human beings in the world, called the different animals of the forest to assemble before him and to show him what their conduct would be when man appeared in their midst. The various animals were questioned by the hero. The moose, when asked what he would do, declared that he would take to flight. The red squirrel threatened that he would carry a man into the nearest tree and gnaw his head off. At that time the squirrel was as big as the moose, but after this threat he was seized by the hero, who stroked him until he shrunk to his present size and became harmless, though, to be sure, little subdued in spirit. The other beasts went away angrily, shaking themselves and saying that man would be too poor. Finally one animal stood forth and offered to live with man, sharing his poverty. It was the dog. Then the hero, after thanking the dog, spoke to the others, and ordained that those who went off shaking themselves should henceforth hold in fear not only man but the dog as well. Since that time man and his canine companion have continued in their hunting partnership. Their close relationship not only on the hunt but in the other activities of life in the American *taiga* is well exemplified among the Labrador Indians.

The Snowy Owl in Its Northern Home¹

By ALFRED M. BAILEY

Of the Colorado Museum of Natural History

WE were making our way slowly under the precipitous walls of Cape Lisburne, through the piled-up sea ice which crowded the frozen Arctic in northern Alaska. For days we had traveled without a sign of wild life other than an occasional track of *p'shukok*, the Arctic fox, or the faint prints of a lemming wandering aimlessly across the tundra, but early this particular morning the keen-eyed dogs saw a black object perched upon a high pressure ridge out on the broken ice field. I could not imagine what the dark-colored bird might be, so detouring between the hummocks, we slowly made our way in its direction. It soon took to flight, however, its broad expanse of wing gleaming dark in the bright light of the Arctic spring day, its shadow moving grotesquely from one ridge to another as it sailed swiftly away. My Eskimo companion said "*upik*," and then I knew that my black-appearing bird was the snowy owl, his white plumage black against the sun, and especially so when contrasted with the high lights of the glittering ice pinnacles. Later, we had occasion to note these owls many times on our journey down the coast, but at no time did the contrast seem so noticeable as when we were among the broken ice fields off Cape Lisburne.

The snowy owl is usually classed by ornithological writers as a bird that is abundant in the northern regions, but from my experience, and from what I am told by natives and traders of the Arctic coast, its numbers are not great, --just a few birds scattered here and there across the vast extent of tundra,

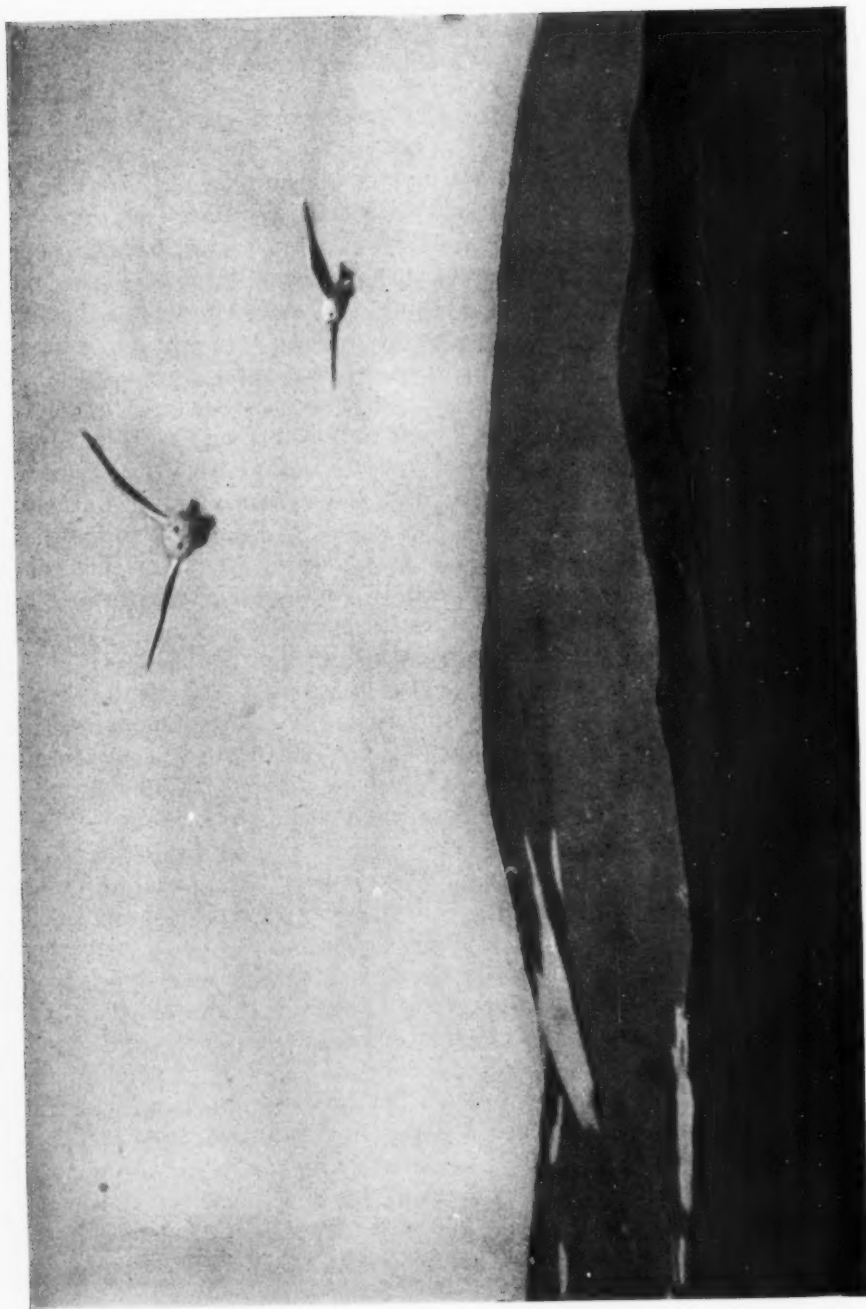
their abundance presumably being dependent on the food supply. This dependence, however, does not seem to hold true always, for on a twenty-five day trip inland for caribou, my companion, Mr. R. W. Hendee, saw but three owls, notwithstanding the fact that ptarmigan were exceedingly abundant in the country traversed.

During the summer of 1921, we saw birds at points along the entire Arctic coast of Alaska, from Demarcation Point, the boundary between Canada and Alaska, to Cape Prince of Wales. They were very shy, rarely allowing one to come within rifle range; in fact, one could scarcely approach within identifying distance.

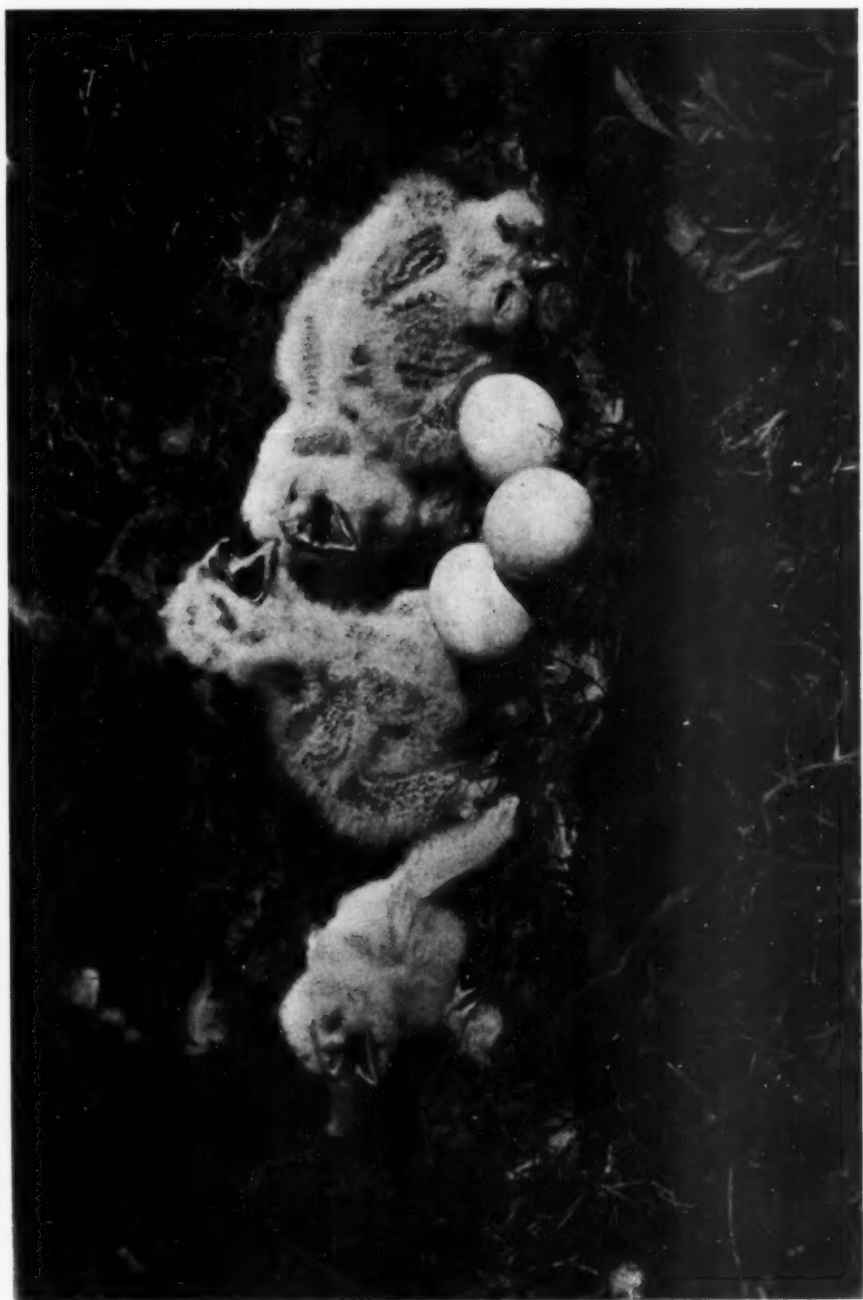
At Wainwright, our winter headquarters near northernmost Alaska, these birds proved very scarce during the fall and winter. During the spring months, April and May, they seemed to congregate along the coast, often far out on the sea ice; then, soon after the leads opened, more birds appeared, the Eskimos claiming that they were catching crippled eiders, which were rather numerous in the vicinity of the native villages.

Few ornithologists have found nests of the snowy owl, so when Mr. Frank Dufresne volunteered to show us a nest which he had "staked" upon the tundra back of Nome, we considered ourselves fortunate. A few miles of rolling tundra, literally dotted with small lagoons, and covered with moss, grass, and waving fields of "Alaska cotton," separate the gold-bearing sands of Bering Sea from the foothills, and here, as soon as the winter snows

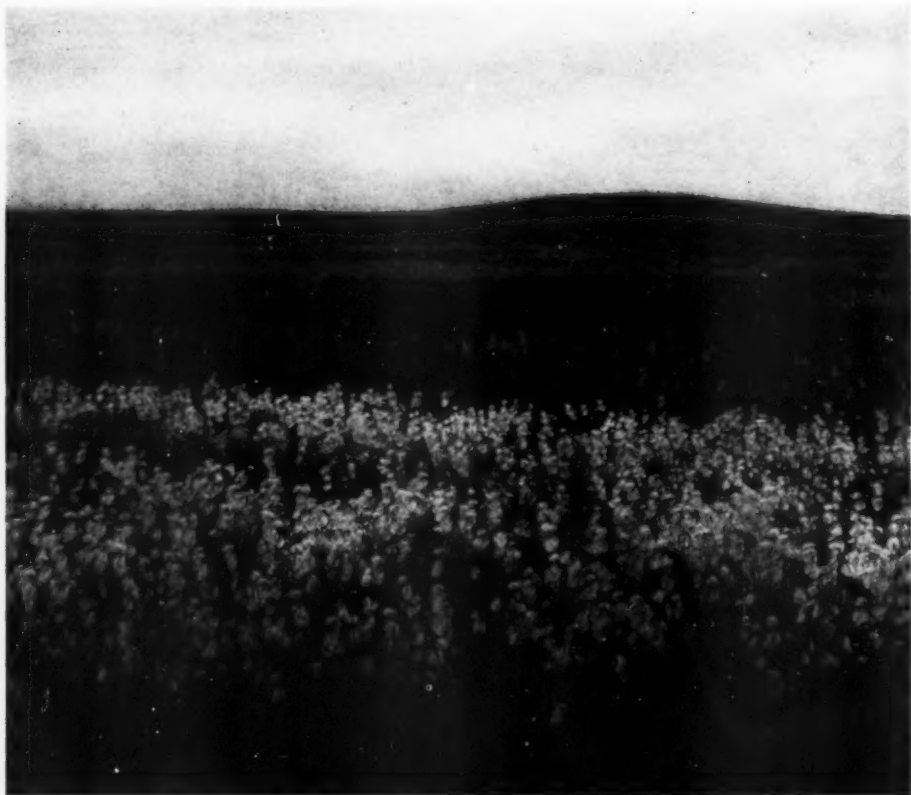
¹Photographs by the author



ANXIOUS PARENTS FLYING OVERHEAD



FOUR UNGAINLY OWLETS—THE OBJECTS OF SOLICITUDE



A field of "Alaska cotton"

have melted, numerous Arctic birds congregate to raise their families. In such a setting we found the home of the snowy owl, where an abundant bird life would supplement the food supply of the growing young. The nest was on a ridge that rose from the tundra; it was a mere depression in the moss, scantily lined with willow leaves. Anvil Mountain and the other foothills were half a mile away, their sides still snow-seamed, but on the tundra plants were growing luxuriantly. In the nest there were three addled eggs and four typical little owls, ungainly and homely, with their eyes tightly closed against the brightness of the northern light. As subjects for a photographer they were most unsatis-

factory, for they huddled together with faces hidden, looking like so many pieces of cotton.

If the young failed to show action, however, the adults made things interesting enough. At our approach they had soared to a distant mound, where they perched for a time, but soon the male, a beautiful white specimen, started sailing overhead, uttering his hoarse *who-who*. Occasionally he was joined by his mate, and against the light blue sky as a background, they offered an attractive target for our camera. Unfortunately, Arctic light is rather poor for speed pictures. The male bird would sail with the wind, and then circling, would dart within a few feet of us, his wings whistling and

talons outstretched. He dropped from the sky on folded wing with marvelous speed, and time and again I caught myself dodging his onslaught, but he seemed to give most of his attention to my bewildered Airedale, who crouched in the grass with a slit ear, not knowing from where the attack came.

We left the nestlings for a few days, but revisited them on June 24. The weather had turned very warm and clouds of mosquitoes rose from the grass and circled over the panting, helpless young. Each little fellow had his eyes closed to the merest slits because of the bright glare and, fringing the eyelids of each, were rows of mosquitoes. On this occasion the old birds were not so fierce but now and then sailed anxiously overhead, and subsequently alighted on a distant tundra hummock.

The snowy owl feeds, I believe, to a greater extent upon small mammals than upon birds, for although only a few ptarmigan feathers littered the

nest, there were several rodents (*Microtus*) awaiting consumption. Later, I saw owls with ground squirrels in their talons, and specimens which we collected had been eating lemming and mice. The owls take also many ptarmigan in the course of a season, and for that reason are persecuted at every opportunity, no doubt justly. Mr. Dufresne told me that several other pairs of these owls had been nesting in the adjoining foothills but that their nests were always broken up by the prospectors as soon as found. Locating several pairs of nesting owls in the vicinity of Nome would prompt an ornithologist to declare them "fairly common breeding birds," but Mr. Dufresne told me that the following year he failed to find a nest, so instead we shall have to place the status of the snowy owl as irregular; it may be fairly common at points along the Arctic coast one season where it will be absent the next.



The tundra near Nome as it appears in June

The Coastal Prairies of Southern Texas

AN ORNITHOLOGIST'S PARADISE

By LUDLOW GRISCOM

Assistant Curator of Birds, American Museum

EVER since taking a brief trip to Corpus Christi several years ago I had planned to revisit a region which gave indications of being extraordinarily rich in bird life. This plan was quickened by the investigations of Mr. T. Gilbert Pearson, president of the National Association of Audubon Societies, who rediscovered the whooping crane and found many breeding colonies of rare and little-known water birds in the vast uninhabited coastal prairies and lagoons stretching south from Corpus Christi to the Mexican border. His kindly interest and friendliness prompted him to provide me with the necessary information and letters of introduction, and shortly after Christmas, 1923, I was on my way south, fortunate in the companionship of Mr. Maunsell S. Crosby, an experienced amateur field ornithologist and a member of the American Museum.

A series of peculiar conditions combines to make this extreme southeastern corner of Texas a veritable paradise for the bird lover. Approximately in the latitude of Miami, Florida, it has an almost tropical climate, except for occasional "northers," which swoop down with great suddenness, bringing chilly reminders of a higher latitude, though frost is very rare. As a result, a distinctly tropical vegetation flourishes in the richer soil around Brownsville, where the Rio Grande supplies a certain amount of irrigation. A small number of tropical birds here reach their extreme northern limit, and occur nowhere else in North America. On the other hand, numerous breeding

species of the southern United States reach here their approximate southern limits. Two groups of species are irregular visitants to the region in winter, and for similar reasons. One group, wintering chiefly in the tropics, lingers this far north in mild seasons. Another, hardier group rarely occurs as far south in winter, reaching so low a latitude only in seasons of exceptional severity.

The plains and prairies of the central United States are a dividing line between a distinctly eastern and a western bird fauna. In the Brownsville region these plains and prairies have narrowed to relatively few miles, resulting in the mingling of western, eastern, and prairie types. A considerable number of western or Sonoran species, therefore, here reach their eastern or southeastern limits. This narrowing of the continent causes a similar convergence of migration routes. Numerous eastern species, disliking to cross the Gulf of Mexico on their way to their winter quarters in Central America, are forced to pass through the Brownsville region twice annually, and the path of migration of several Rocky Mountain or western species extends as far east as the open arid country that they favor. Add to the foregoing analysis that lonely beaches, extensive fresh and salt lagoons, vast coastal prairies, heavily wooded watercourses, stretches of cactus scrub and desert, and fields and plantations occur in close proximity to one another, and we can see why more than 350 species of birds have been

recorded in a small area, where relatively little exploration has been attempted and almost no continuous observation has been undertaken. There is no doubt that more varieties will be detected, and new stations for rare species will be found, as more remote sections are visited by competent naturalists. Brownsville might well hang out a sign reading, "All tastes satisfied here."

The reader will now readily understand the eagerness with which two naturalists looked out of their Pullman windows early on the morning of January 3, 1924, as the train was just entering the territory of the great King Ranch. The alternating pine woods and cypress swamps of the day before had disappeared, and an unbroken expanse of flat prairie stretched away to the horizon in every direction. The cheerful and light-hearted negroes had been replaced overnight by Mexicans, whose wattle huts had the charm of relative novelty; the adobe houses in the Mexican sections of the few towns had a distinctly Spanish atmosphere. One missed the trees, the frequent water towers being a poor substitute aesthetically, but the compensation lay in a vastness of sweep and the immensity of space, which a rolling and wooded country cannot convey. A brilliant sun burned in a cloudless sky, the air was warm and balmy, and the prairie grass rippled before the wind like the waves of a copper-colored sea.

After a breakfast at Kingsville, the headquarters and the administrative center of the King Ranch, we embarked upon a most remarkable train ride. There had been a good deal of rain the preceding fall, and thanks to the impermeability of the Texas soil, the prairies were dotted with ponds and sloughs in every direction. During a

five-hour journey we found every one of these ponds covered with ducks of many species, grebes and coots, while killdeer plover, yellowlegs, and black and white stilts with incredibly long red legs, bobbed and probed on their margins. The passing of the train was a well-known daily event, which had long since ceased to arouse the slightest interest. Many did not bother to fly, and from the rear platform we could have hit them with stones, or shot the legal limit of twenty-five before the ride was concluded.

About two hours south of Kingsville the railroad passed through a low range of sand hills, which are regarded by the residents as an important frost barrier. After this the prairies became dotted increasingly with patches of "chaparral"—a low scrubby growth of mesquite, huisache, and other trees, most of them thorny and prickly. A large number and variety of hawks were the outstanding features of this section. At our approach a flock of wild turkeys rushed madly away into the nearest scrub, and an occasional white-necked raven or caracara flapped by looking for carrion. About one hundred miles south of Kingsville the train leaves the King Ranch and enters a more fertile section, where there is plenty of timber. Between Harlingen and Brownsville the country is settled, fields and plantations alternating with orange and grapefruit groves.

At Brownsville we were fortunate enough to find Mr. R. D. Camp, federal and state game warden, just returned from a tour of duty. An enthusiastic conservationist, he now devotes his entire time to protecting the wild life, and has succeeded in gaining the respect and support of the leading citizens of the huge area in

which single-handed and alone he is doing his best to enforce unpopular game laws. In recent years his summers have been spent in the lonely work of guarding remote colonies of terns and egrets on desert islands in the Laguna Madre. He rendered us invaluable assistance through his knowledge of the best localities for rare and unusual birds, particularly when his duties permitted him to accompany us as guide. One conference was sufficient to plan out a schedule of trips, which was put into effect immediately.

In southern Texas, the tenderfoot (and any northerner or easterner is regarded as a tenderfoot) must be prepared for endless encomia on the wonders of the country and for tales of blood and violence! Apparently so many tourists have visited the region, looking for signs of Mexican revolutions, gunmen, and other evidences of unsettlement that all outsiders are regarded as thirsty in these respects, and with a somewhat naïve courtesy your supposed wants are generously supplied. In Matamoros across the border, every imperfection in a concrete wall is caused by a rifle bullet; a defective cornice is invariably due to a shell; and this street and that have run with gore. A glance at the powdery white dust, ankle-deep over everything, is sufficient to convince one of the improbability of any such phenomenon. One hears much of little "arguments" between "perfect gentlemen," which end fatally for the less able debater. The visitor's scepticism must not be voiced, as it would give the greatest offence. If this fine point in deportment is observed, the country is yours, and everyone goes out of his way to help you and to further your aims, with an open-handed hospitality

and friendliness which I have never found excelled anywhere. Without such generous assistance we could not have seen so much in so short a time.

Perhaps the most impressive feature of the bird life about Brownsville was the slight extent to which the birds were affected by man and his works. A half hour's observation at daylight the next morning on the platform of the railroad station, while we were waiting for the train to Point Isabel, yielded nearly twenty species of birds, including white-fronted geese, several species of ducks, and two snowy white American egrets—an experience which it would be hard to duplicate.

The train for Point Isabel proved to be a Ford truck made over to look like a train, and we staggered and lurched out of town over a sinuous track. About five miles out we left the scrub country and emerged on the coastal prairies, stretching away to the Laguna Madre, intersected with numerous smaller lagoons, some fresh and some brackish. The train obligingly stopped in the middle of nowhere, at the nearest point to one of these lagoons. The region is known locally as "Jackass Prairie" (pronounced *Perrairie*!) because donkeys and mules have run wild there. The only inhabitants are a few wretched Mexicans, who make a precarious living catching the jackasses and selling their hides in Brownsville.

A lonely and desolate region, immense, hot, and thirsty, but a paradise for birds! The lagoons were covered with white pelicans and ducks. Geese of four kinds were occasional in flocks. Terns and gulls hawked over the waters or the marshes, which were the feeding grounds of numerous herons, and we were fortunate in finding three of the rare snowy egrets. Sandpipers and plover of various kinds swarmed

on the flats. The prairies were covered with meadowlarks, pipits, and savanna sparrows. Lines of long-billed curlew streamed away in front of us, whistling harshly, their wings bright cinnamon beneath when raised in flight. They are as large as chickens, and have curved bills six or more inches long. In an arid patch of cactus and yucca, we found some pretty black-throated sparrows, a sage thrasher, and some curve-billed thrashers,—western species here reaching their eastern limit. A total of eighty species on a trial trip in an unfamiliar country!

Another interesting trip was that made to some wild scrub country about fifteen miles north of Brownsville, where we camped out for a week-end. Water, that vital essential, is often provided by what is known locally as the *resaca*. The turbulent Rio Grande in time of flood is ever changing its course, and the term *resaca* (literally surf) is used to designate a former course of this river. Some *resacas* wind for miles through the country and are filled with water. As a result, the most luxurious vegetation of the region grows on their banks. Glossy green ebony trees and other tropical varieties form almost impenetrable masses of thorn and prickly, as luxuriance is measured by density and not by height. These *resacas* are the chosen haunt of many species of birds, including some of the tropical ones, and no trip to southeastern Texas is complete unless several visits are paid to them. Here gorgeous green jays skulked through the underbrush, the handsome Derby flycatcher called harshly from a conspicuous perch, and an occasional Audubon's oriole flashed across an open space. Shy and gentle white-fronted doves walked around in dense cover, and in the very thickest growth of

all lived the secretive chachalaca, only representative of a group of tropical game birds, the name of which is an imitation of the loud, harsh, cackling cries with which birds of this species greet the dawn in chorus.

A climb of fifteen feet out of the *resaca* brought us to the cactus-covered desert plain, where walking was necessarily a very cautious and careful proceeding. Here were road runners, an eccentric cuckoo which runs away instead of flying, great cactus wrens, the shy Sennett's thrasher, and the pretty little verdin, a gray bird with a bright yellow head. A burrowing owl bobbed and blinked at us from the entrance of its burrow, and near by we flushed some chestnut-bellied scaled quail. A flooded pasture was full of ducks, and I saw more blue-winged teal there in one day than I had seen in ten years' field work in the Atlantic states. The flats were covered with shore birds, and a flock of white-faced glossy ibises were probing in the mud with their long bills, honking like geese. Filled with a fearful "mulligan" distilled by Camp from the "innerds" of some wild ducks, we rested somewhat fitfully under the stars on ground as hard as iron, devoured by seed ticks, and listening to the plaints of a screech owl and some Merrill's parauques—a tropical goatsucker.

Thanks to the courtesy of Mr. Caesar Kleberg we were his guests for a day at Norias Ranch, the southernmost property of the great King Ranch, containing about half a million acres. He is an ardent conservationist, and takes great pride in the incredible abundance of game on the section administered by him. A herd of pronghorns and thousands of wild turkeys are perhaps his most cherished possessions. So flat is the prairie that a

lively and ambitious Ford was quite independent of roads, and we rushed over parts of the estate where game was to be expected, watching the head cowboy shoot galloping coyotes from an auto with a rifle at 250 yards, scarcely ever missing his mark. We saw 14 kinds of ducks, 3 kinds of geese, hundreds of curlew, at least 100 quail, and a flock of stately sandhill cranes.

Our final trip was in search of the whooping crane, which Mr. Pearson had found the preceding year in the northern half of the King Ranch; his host, Mr. Richard M. Kleberg, had assured him that it had wintered there regularly. It is now one of the rarest of North American birds, and there had been no winter or breeding records of it in many years. It is one of our most magnificent birds,—pure white, with black-tipped wings, and standing $4\frac{1}{2}$ feet high, with a wing expanse of 8 feet.

The northern part of the King Ranch is a huge tract of prairie containing about a million acres. It is divided into sections, which are subdivided roughly into different pastures. However, a pasture may be a hundred square miles, fifteen or twenty miles from the ranch house, and to count the cows that range over it may necessitate a week's absence! Mr. Richard M. Kleberg kindly invited us out to Laureles Ranch, and was a most courteous and attentive host, affording us every possible facility. He, too, was an enthusiastic conservationist, and was quite proud of having whooping cranes on his property. The ranch house is thirty miles east of Kingsville in the middle of the lonely prairie, but it has electric light, running water, a special guest house, a piano, and many other unexpected conveniences and luxuries.

There were special quarters for the Mexicans and their families, and a school was provided for the children.

The next morning we started off in a Ford for the Laguna Larga, a shallow body of fresh water about ten miles farther east. Here, a mile from shore, we discovered four stately whooping cranes feeding in the shallow water, while geese, ducks, and shore birds were visible in every direction. It was impossible to approach any nearer the whooping cranes at that time. In the afternoon we took a sixty mile drive, going entirely around the lagoon. The wetter prairies were covered with geese, the lesser snow goose being particularly handsome and conspicuous in flocks of hundreds. In what are called the Shin Oak Prairies we saw hundreds of the sandhill crane, which is a foot smaller than the whooping crane and of a uniform grayish brown. This, too, is a rare bird; it is rapidly decreasing and has already become extinct in most of the eastern part of the United States. I do not believe a greater number of these cranes could be seen in any other part of North America today. At the south end of the Laguna Larga we again found the four whooping cranes, and this time were able to stalk them to within 250 yards. The long plumes of the secondaries cover the black wings in repose, and the birds appear pure white except for the patches of bare red skin and the black streaks on the head and the long black legs. These four birds were very wild and shy, and the ducks which we scared up by our approach gave them the alarm. With long necks fully extended the cranes stood more than five feet high; shortly after our arrival they flew away with steady powerful strokes of their great wings,—a picture no nature lover could ever forget.

In spite of renewed investigations in Saskatchewan, and the discovery of two breeding pairs, there is not the slightest evidence to justify the hope that a hundred individuals of this magnificent bird remain alive. Three-quarters of its former breeding range is now given over to cornfields, and its conspicuousness and size will make its migrations a peril, even if it is safe in its present winter and summer haunts. On the coastal prairies of southern Texas, however, it, as well as many

other kinds of waterfowl and game, will be safe as long as the great ranches remain intact. Their owners enforce the laws, and hundreds of square miles are unvisited by a human being from one year's end to the other. Let us hope that these conditions will continue, as the majority of the natives are hostile to laws restricting the taking of game. They cannot realize that its incredible abundance is due to local conditions which do not prevail in most parts of the continent.



The Whooping Crane Group in the American Museum:—This stately bird has been brought to the verge of extinction. Until the recent discovery of a few survivors in southern Texas, there had been scarcely any records of the occurrence of this bird in the United States for decades, and the breeding grounds of the few remaining individuals were not definitely known. Yet at one time the whooping crane must have been relatively plentiful. In December, 1811, on the Mississippi, Nuttall witnessed a migration of this species assembled in a "mighty host." Their flight took place at night, down the great aerial valley of the river . . . The clangor of the numerous legions passing along high in the air seemed almost deafening . . . and as the vocal call continued nearly throughout the whole night without intermission, some idea may be formed of the immensity of the numbers now assembled on their annual journey to the regions of the south."

The Hoop Snake Story

WITH SOME THEORIES OF ITS ORIGIN

By KARL PATTERSON SCHMIDT

Assistant Curator of Reptiles and Amphibians, Field Museum of Natural History

ONE of the most persistent and widespread snake myths in the United States tells of a large serpent which takes its tail in its mouth and rolls like a hoop. It is further reputed to have a poisonous sting in its tail, which is launched at its enemy from the rolling position. This story has come to be associated with various snakes in different parts of the country. My interest in the story was aroused during a stay in Louisiana, where I could gather eyewitness testimony regarding one of the "hoop snakes" (*Abastor erythrogrammus*) and the "stingin' snake" of the genus *Farancia*. It appears that the supposed habit of rolling like a hoop is an elaboration of the more fundamental belief in a snake with a poison sting in its tail.

My first impression was that this must be one of the universal snake myths, and I thought of the familiar "snake" bracelet or finger ring, in which the head of the snake meets the tail. On inquiry, however, there appears to be no classical or European analogue of the American hoop snake story.¹ Herodotus, the earliest source of some still current misinformation concerning reptiles, is not the fountainhead of this legend, and it does not find place in Pliny, whose voluminous Natural History would surely have included a story so much in his own vein, had he known of it. My search of possible European sources was

slight, but it gave no clue to a European prototype of the hoop snake yarn.

Turning to American sources, our search is at once rewarded by finding references to the horn or hoop snake in early accounts of travel in this country.² These accounts may speak for themselves. The earliest is in a letter dated 1688 that was written by John Clayton to the Royal Society of London:³

"There is another sort of deadly snake, the Red-Snake; I once narrowly escaped treading on the back of one of them. They are of an ugly dark brown Colour, inclining to red; their bellies are of a more dusky white, with a large streak of vermilion Red on either side; this too is of the Viper kind, but is not so short, but its tail is more taper and small. The Horn snake, is as they say, another sort of deadly snake; I never saw any of them unless once, shortly after my Arrival in that Country, which I cannot attest to being the Horn-Snake, for I could not distinctly view it, being in a thicket of sumach; it was perched up about two feet high in a Sumach Branch, its Tail twisted about the Shrub, and about a quarter of a yard stood bolt forward, leaning over the forked branch thereof: I could not see the Horne, with which it strikes, and if it wounds, is as deadly as the Rattle-Snake's Bite. The Gentleman that was with me told me it was the Horn snake; but being in hast, and on

¹The Midgard serpent of Norse myth, a sea monster represented as encircling the earth, could not, in the opinion of the writer, have had a bearing on the hoop snake story.

²For a list of volumes which were searched for mention of the hoop snake, I am indebted to Dr. A. H. Wright of Cornell University.

³Force, P., *Tracts relating to America*, Vol. III, No. 12, p. 44. Washington, 1844.

Horseback, and the Snake in a Thicket, I could not see the Horn; but had I thought I should never have seen more of them, I should have took a little Pains to have been better satisfied. This I think may not improperly be referred to the Dart Snake."

Here are a number of elements that go to make up a typical snake story. A description of the mud or rainbow snake (it is impossible to be sure which is meant); a "horn snake," with the horn in its "front," apparently one of the tree snakes, or possibly a black snake; and not least, the abundant excuses for not making a more thorough investigation.

The next account is that of Robert Beverly, in a *History of Virginia* published in London in 1722.¹ He writes: "They have likewise the Horn snake, so called from a sharp horn it carries in its tail, with which it assaults anything that offends it, with that Force, that as it is said it will strike its tail into the But end of a Musquet, from whence it is not able to disengage itself."

In this short note are two distinct additions that are familiar in later accounts: first, the transference of the horn to the tail; and second, the characteristic of striking with such force as to remain fast in the object struck. No mention is made of the horn being poisonous,—an oversight which is supplied by our next reference.

Alexander Hewatt, writing in 1779,² describes the fangs of the rattler and other genuinely poisonous snakes; he then goes on to say: "The horn snake is also found here, which takes his name from a horn in its tail, with which he defends himself, and strikes

it with great force into every aggressor. This reptile is also deemed very venomous, and the Indians, when wounded by him usually cut out the part wounded as quickly as possible so as to prevent the infection spreading through the body."

In this account the name of "Horn snake" is reinforced, and the quality of venom added. This is the only reference to a belief in stinging snakes on the part of the North American Indians which has come to my attention. It would be highly interesting if these legends should be found in North American Indian folklore, and in that case my hypothesis, subsequently stated, of an African origin could be discarded.

The next account in our list is supplied by one J. F. D. Smyth, in 1784.³ As this is the first account—I had almost said authentic account—which introduces the "hoop," I shall quote it in full. Referring to a stay in western North Carolina, he writes:

"While I was at Sawra Towns, one day a little lad of Mr. Bayley's came to acquaint us that he had killed a horn-snake, which being a curiosity that I was extremely desirous of observing and examining with particular attention, I accompanied him to the place where he said he had left it; but when we arrived there, to my great disappointment, it was not to be found. He assured me that it must not have been quite dead, and had recovered so much as to be able to crawl from the spot on which he had left it, and had secreted itself somewhere among the leaves.

"However, everyone, and all the inhabitants, with the greatest confidence asserted, and avowed their

¹Beverly, Robert. *History of Virginia*, p. 261. London, 1722.

²Hewatt, Alexander, *Historical Account of South Carolina and Georgia*, Vol. I, p. 87. London, 1779.

³Smyth, J. F. D. *Tour in the U. S. A.*, Vol. I, p. 263-65. London, 1784.

having seen such snake, though very seldom.

"They represented them to me as the most formidable and direful foes in existence to the human race, and to all animation; poisonous and fatal to a degree almost beyond credibility.

"He is described as something resembling a black snake, but thicker, shorter, and of a colour more inclining to dark brown. He never bites his adversary, but has a weapon in his tail, called his sting, of a hard horny substance, in shape and appearance very much like to a cock's spur: with this he strikes his antagonist, or whatever object he aims at, when he least expects it, and if it penetrates the skin it is inevitable and sudden death.

"So very virulent is his poison that it is reported, if he should miss the object he pointed at, and should strike his horn through the bark of a young sapling tree, if it penetrates into the sap or vital parts, the bark or rind will, within a few hours, swell, burst, and peel off, and the tree itself will perish.¹

"As other serpents crawl upon their bellies, so can this; but he has another method of moving peculiar to his own species, which he always adopts when he is in eager pursuit of his prey; he throws himself into a circle, running rapidly around, advancing like a hoop, with his tail arising and pointed forward in the circle, by which he is always in the ready position of striking.

"It is observed that they only make use of this method in attacking; for when they fly from their enemy they go upon their bellies, like other serpents.

"From the above circumstance, peculiar to themselves, they have also derived the appellation of hoop snakes."

¹What may be an indirect reference to the account of Mr. Smyth appears in Charles M. Walker's *A History of Athens Co., Ohio*, p. 97, Cincinnati, 1869: "Early travellers mention the hoop snake, stinging with their tails, and so malignant as to cause the death of a green tree if struck."

This account may be considered the first in which the hoop snake myth appears in full flower. It is to be noted that the hoop snake story is added to that of the horn snake. It is difficult to avoid the conclusion that some village genius has invented the hoop snake and blended his creation with the horn snake, the reputation of whose venomous tail sting was a really current snake "myth."

In a *View of South Carolina*, by John Drayton, published in Charleston in 1802, appears a list of the snakes of South Carolina that includes the horn snake. Robert Mills, in *Statistics of South Carolina*, 1826, also mentions a species under this name.²

John Lee Williams, in a *View of West Florida*, published in 1827,³ lists various snakes and writee: that "... a livid looking mud asp, that has sometimes been mistaken for an eel, has in several instances proved fatal to those who expose themselves by wading in muddy creeks." This looks very much like a reference to the horn snake under a new name, for this snake really lives in mud and its sides and belly are a "livid" red.

The single case of scepticism on the part of a person mentioning the horn snake that has come to my attention in works of the nature thus far quoted is that of J. H. Hinton. In his *History and Topography of the United States*, published in London, 1832, he writes⁴ that "The accounts of the deadly venom of the Horn-snake being without actual attestation by fact, are considered as unfounded."

There is no doubt that this list of references to the hoop snake could be much extended. I have not examined

²Mills, Robert. *Statistics of South Carolina*, p. 102. Charleston, 1826.

³Williams, John Lee. *View West of Florida*, p. 28. Philadelphia, 1827.

⁴Hinton, J. H. *History and Topography of the United States*, Vol. II p. 185. London, 1832.

current sources, for there is no difficulty in gathering any number of contemporary accounts of the hoop snake and the horn snake from alleged eyewitnesses, especially in any one of the southern states. These accounts are not to be confused with yarns spun for the misinformation of the traveler. If one expresses doubt, he runs real danger of seriously offending the narrator; and the stories are attached to perfectly definite and well-known species of snakes, which are greatly dreaded and shunned. The first specimen of the "stingin' snake" that I collected, I brought in alive to a camp in Louisiana, and I had difficulty in convincing my camp mates that it was not by virtue of occult power over snakes that I escaped the predicted death. I had already gathered accounts from a considerable number of eyewitnesses, of the death of various animals from the sting of the "stingin' snake," and when I confronted my informants with the living source of their fears, they were forced to make the difficult choice between their traditional belief and the evidence of their eyes and of common sense.

In the locality in question (Natchitoches Parish), it was *Farancia abacura*, the horn snake or mud snake of other sections, to which the stinging powers were attributed. There was no hoop snake story current in this section of Louisiana. Only one family, which had come from Georgia, knew of it. All the members of this family would have been glad to take oath to having seen the veritable hooping of the hoop snake in their native state. They apparently referred their experience to the rainbow snake (*Abastor erythrogrammus*), which in many parts of the South is known as the "hoop snake."

Both of these snakes lend themselves well to their legendary rôles. They are large, brilliantly colored serpents, which because of their habits are very rarely seen, for they burrow in soft mud or soil in wet localities, or frequent swampy areas which are sparsely inhabited. The terminal scale of their tail is considerably enlarged and is spinous or horn-like, so that the examination of a dead snake, the only kind ever examined, lends apparent support to the theory of a sting. Further support is derived from the actions of the living snake, though it is doubtful if the authors or bearers of the "stingin' snake" stories ever observed the reptiles alive. When held in the hand, the mud snake (which is the more familiar to me) coils around the hand, and explores or feels about with the tip of the tail with sufficient force to give a considerable prick, though I doubt if even a large snake would penetrate the skin with its tail spine. This is the normal, or slightly modified, habit of constricting snakes in general, which attempt to tuck the tail beneath a coil or otherwise secure a purchase for it, to enable them to constrict.

An account by T. G. Dabney,¹ who was a good observer both of snakes and of human reactions to them, illuminates the problem of explaining the many eyewitness accounts. He writes, concerning a specimen which was brought to him:

"It had just been killed, but had enough vitality for tail movements. It was carefully carried on a fire poker to the porch for good light. The poker was pressed on the tail, which set up a lively oscillation, and the observer distinctly saw a sting, protruded and withdrawn 'in a flash,'

¹Copeia, No. 73, p. 73. 1919.

but saw no repetition of the exposure. A dissection showed the tail vertebrae descending in a diminuendo to the fine pointed extremity of the tail, and no place for a 'sting.' This shows that we are very likely to see what we expect to see, when snakes are involved; and the average person is prone to accept first impressions, and any extravagant statement about snakes, without any inclination to verify, or disprove them."

The most pronounced development of a tail spine in snakes that has come to my notice is that of some of the blind burrowing snakes of the family *Typhlopidae*. Living specimens held in the hand make the same exploration with the tail spine, which is very sharp, as I have described above in the case of the horn snake. Mr. Herbert Lang, leader of the American Museum Congo Expedition, informs me that the African natives believe that the tail of these burrowing snakes is used as a sting, and that these snakes are relatively abundant in Central and West Africa. It seems a plausible hypothesis, therefore, that the stories of stinging snakes were brought from Africa by the negroes imported as slaves. The transfer of this reputation from the burrowing snakes of Africa to American burrowing snakes offers no difficulty to anyone

familiar with the permutations and combinations of popular names for animals.

The habit of the common black snake of eastern North America of gliding along at great speed over the tops of bushes, without descending to the ground, may have a bearing on the origin of the belief in the hoop snake's rolling method of progression. Where the horn snake and rainbow snake do not occur, there seems to be a tendency to identify the hoop snake with the black snake or blue racer.

The only remaining hypothesis for the origin of the stories of the stinging snake and the hoop snake that has come to my attention rests on the comparison with scorpions. Scorpions do have a veritable sting in their tails, and they do advance with the sting raised over the back "in the ready position of striking." The remoteness of the scorpions from snakes in zoölogical classification seems to offer little difficulty to the popular imagination. In the same section of Louisiana where I collected my first hoop snakes, I heard repeatedly about "stingin' lizards." My informants thought they had scored a clear triumph against my scepticism when they showed me scorpions to prove their assertion that there *were* "stingin' lizards" that really could sting!

The Social Wasps—*Polistes* and *Vespa*

AN INVITATION TO CLOSER AQUAINTANCE WITH THE HORNETS
AND THEIR RELATIVES

By WILLIAM M. SAVIN¹

SOCIAL wasps of the genus *Polistes* are comparative strangers to most persons although there is a wide, even if superficial, acquaintance with their near relatives of the genus *Vespa*, commonly known as hornets and yellow jackets. The nests of *Vespa* consist of several combs built one beneath the other and enclosed by a protective envelope. The nests of *Polistes*, on the other hand, have but a single comb, oblong or more or less circular, the cells of which are exposed to view. The nests of *Vespa*, often comprising several stories, accommodate as a rule a larger number of tenants than do the single-story dwellings of *Polistes*. A large nest of *Polistes annularis* contained about 1500 cells; one of *Vespa germanica* had about 14,000 and the huge nests of *Vespa maculata* have many more.

While the nests of *Polistes* are always constructed above ground, those of certain species of *Vespa* are located in hollows excavated in the earth. As a rule it is the short-cheeked forms that in North America and Europe dwell in the ground while the long-cheeked species build aerial nests. One of the large European species (*Vespa crabro*), which constructs its nest in hollow tree trunks and like places, made its appearance in this country in recent years. A colony of this wasp established itself on my place in New Jersey, occupying a bird house on a tree near a driveway. As the wasps created consternation among the neighbors, some one destroyed not only them but an opportunity for studying them.

To construct their nests many of our social wasps use paper made from small pieces of wood taken from old unpainted buildings, weather-beaten fence boards, and many other sources of supply, but *Vespa crabro* uses fresh wood. After being chewed into a pulp and mixed with saliva these scrapings are applied to the nest. It has been suggested that the idea of making paper from wood pulp was first conceived by human beings as a result of their observing the social wasps.

A colony of *Polistes* is usually started by a single female in the spring and, in temperate regions at least, it endures only until the fall. In similar fashion a *Vespa* community is begun by an overwintered queen. In both genera the queen first lays the foundation of a few cells and deposits in each of these an egg. She is obliged to forage for the larvæ that are hatched from these eggs but, when these larvæ finally pupate and emerge as adult workers, they relieve her of her miscellaneous duties by assuming in their turn the task of enlarging the nest and of feeding their younger sisters, while the queen confines her activities to supplying the eggs. The workers are imperfectly developed females. Only late in the season are eggs laid which produce males and fully developed females.

Save the new generation of females, all the members of the colony, including the old queen, die off at the approach of cold weather in the autumn, although there is record for southern United States of some unmated males

¹Illustrations from photographs by the author.



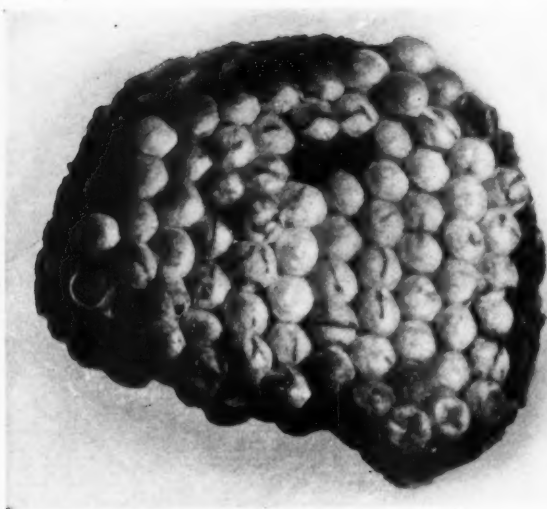
THE ENVELOPED NEST OF VESPA

This nest was found on a privet hedge. The paper covering of the nest (shown in its entirety on the left) was cut away to reveal the combs within. The wasps reverse the human method of construction, building their pendent nests, from the root basementward. The covering consists of many layers, with air pockets between. At the top of the nest here shown were eleven layers; at the right near the top, nine; over the remainder of the nest, only seven. The relatively greater number of layers above is perhaps due to the necessity for protection against the rain



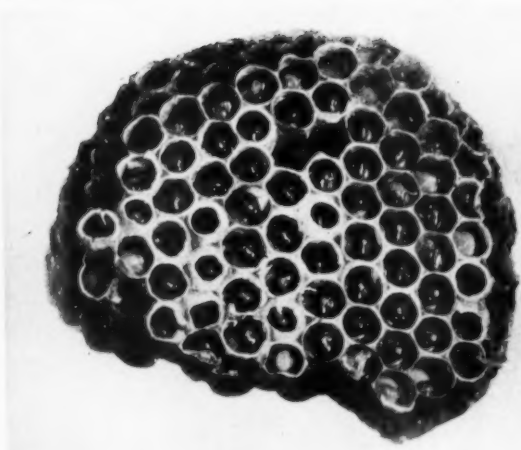
THE EXPOSED NEST OF POLISTES

This nest was attached to an aster growing in a field. It was made secure by a gluey saliva which is also used for water-proofing the nest

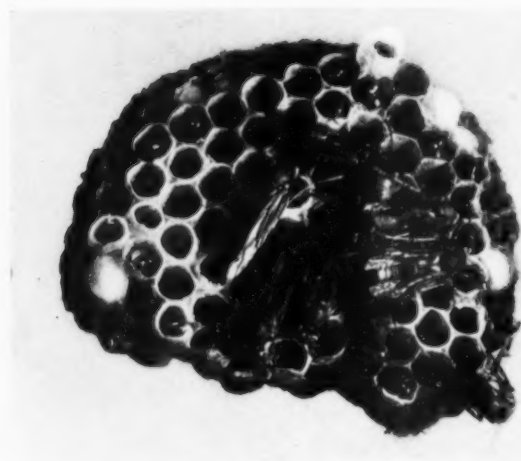


A NEST OF POLISTES
DETACHED FROM
ITS SUPPORT

This nest, turned face upward, contained 135 cells. In each of the seventy cells covered with silken caps (topmost picture) was a pupa or a larva about to pupate. Many of the peripheral cells contained larvæ that had not yet spun their covering.



The silken caps were removed with a razor and the inmates of the cells exposed (picture in middle). In the topmost cell thus uncovered was a larva which set about spinning a second cap for its cell. Only about two-thirds of the exposed pupæ attained the adult stage.



The status of the colony three weeks later is shown in the lowest picture. Only six of the larvæ that occupied the outlying cells spun a covering and none of these emerged. The larva, previously referred to, that spun a second covering after the first had been sliced off reached maturity, as the conspicuous emergence hole in its silken cap gives evidence. Several adult wasps may be seen resting on the nest

of *Polistes* living over until spring.¹ The females hibernate and start new colonies the following year. In contrast to the social bees, which use honey and pollen as food for their larvæ, the social wasps supply their young with morsels of insects they have captured.

The nests of *Polistes* are usually in buildings although sometimes the wasp chooses a site in the open and attaches her nest to the branch of a tree or shrub. It has been suggested that *Polistes* at times appropriates old nests constructed by wasps of a previous year, and it is an established fact that these wasps will build new cells along the border of old nests. Social wasps are provident in using the cells of their own nest more than once, for after the occupant of a cell emerges as an adult the little compartment is cleaned and thereby made ready for the reception of another egg.

The nest depicted on p. 83 was found in a meadow and was attached to an aster over which twined a hog peanut (*Falcata*) partly concealing the nest. Within fifty feet of the site chosen was a rail fence which would have offered more ample protection, but the wasp apparently preferred the open.

As the *Polistes* wasps make their nests waterproof, it matters little where they locate them. These wasps may be seen walking over the nests and it is likely that in so doing they apply a gluey saliva for the waterproofing. The nests are smooth, somewhat shiny, and slightly sticky.

The nest shown on p. 84 was taken on August 26 and contained 135 cells. Seventy of these had been covered with silk by the larvæ preliminary to

pupation while a number of those along the periphery of the comb were open and contained larvæ. To ascertain whether the pupæ would develop normally under changed conditions,



When resting, the social wasps commonly fold their wings and this attitude is the one usually assumed also in death. The above photograph shows one of the species of *Polistes*, a genus readily distinguished from the familiar *Vespa* by its more slender waist. In disposition it is more gentle than the belligerent yellow jacket and, as the present article indicates, its nests with their living contents may even be transferred to the collector's home for observation, without undue risk of being stung. Photograph about natural size.

the silken coverings of seventy cells were cut with a razor, thus exposing the inmates. That these might be better observed the nest was inverted, so that the cells opened upward, as shown on p. 84 instead of maintaining their normal downward position.

From time to time during the next three weeks the wasps emerged from the cells. They were puzzled and seemed to have no idea as to their duties. Most of their time was spent

¹Brimley caught males of *Polistes* from November to March at Raleigh, North Carolina.

in walking over the cells and examining them. They made no attempt to fly away but after a few days they invariably wandered from the comb and failed to return to it, other wasps, as they emerged, taking their places. They would crawl up the wall of the room and, when the nest was held near one of them, she would return to it as though she were recovering some valued possession. This confusion was doubtless due to the fact that the nest had been moved to an unnatural location and not to the uncovering of the pupæ.

Not more than ten adult wasps were on the nest at any one time. Occasionally I would move them about with tweezers but they showed no resentment. They had had no nourishment and it is just possible that this may have so weakened them that they were not interested in anything about them.

On one occasion the nest was taken into another room and placed in the direct sunlight, whereupon all the wasps became very active. The nest was then placed out of doors in a strong sunlight and a few of the wasps flew away.

About one-third of the exposed pupæ died, and, as the workers supplied no nourishment to the larvæ, all of these also perished save six that were so far advanced that they spun their silken caps, but even these six failed to survive through the pupal stage. A larva (one of the seventy insects that were deprived of their silken coverings) spun a second canopy by way of replacing the one removed. It later emerged as a wasp.

The colony-forming habit of certain insects such as *Polistes* is one of the most interesting of the many fascinating phenomena of entomology. To be sure, it has been intensively studied by others, but there is much joy in seeing for one's self. That *Polistes* offers a favorable opportunity for such observations is evident from the facts that their nests are easily accessible to us (not underground, for example); that their activities are not under cover, as are those of the honey bee; and, not the least, that their temper is so mild that they and their nests may be safely taken even into our own homes, as is shown by the experiments to which I have just referred.



It looked as if "All the king's horses and all the king's men" could never make anything out of such a heap of scraps as this—the broken fragments of a vessel long buried in the ruins of an Indian village on Long Island. But a little patience and a pot of glue transformed chaos into shapeliness

Humpty Dumpty Outdone

A HEAP OF BROKEN POTTERY THAT TOOK SHAPE AS A BEAUTIFUL JAR

By ETHELYN G. NELSON

CATALOGUE No. 20-4571 described it as "200-sherds from other vessels," and the location was given as Pit 63, Trench 8, General Diggings, Port Washington, Long Island. It was, moreover, just as uninteresting a boxful of broken pottery as this description suggests. The sherds, spread out upon the work table in the laboratory, did not gain particularly in interest, but shed large quantities of Long Island dirt, later to be transferred to the hands—perchance to the faces—of those who handled the specimens. Anyone but an archaeologist would have incontinently dumped the whole lot into the nearest

garbage can and been thankful to rid himself of the mess.

But there was an attempt at decoration, in the form of incised lines, on a number of the sherds, and it was therefore deemed necessary to sort over the lot in the interests of that awesome thing, SCIENCE. Presently it was noticed that a few of the larger pieces looked as if they might be fitted together, and the archaeologist spent a little time following up this idea, with a view to ascertaining how many of the plain sherds it might be necessary to keep. He succeeded in matching up three considerable rim groups, which appeared to belong to two, perhaps



THE BOWL RESTORED

Piecing sherds together into a pot like this is easier, perhaps, than trying to reconstruct in imagination the life of those who first made and used it. The vessel, so crude and sharply contrasting with our modern ware, was no doubt an expression of the maker's highest endeavor. In fancy we see it, with pointed base sunk in the sand and steam rising from its mouth, as the Indian owner, with baby strapped to her back, lifts from the camp fire hot stones and drops them into it until the water boils to cook her food. The quiet of the Long Island shore, now disturbed by the constant whirl of the restless automobile, was then broken only by the lap of the waves or the tread of moccasined feet. Dome-shaped, grass-covered huts, now replaced by stately residences, then answered all the needs of the people and left undisturbed the wooded landscape. The arrow sped from the bow to furnish food for the pot without breaking the calm. But though we may mend the jar, which has lain crushed in the earth three hundred years or more, we cannot restore to Long Island that idyllic peace—and perhaps would not if we could

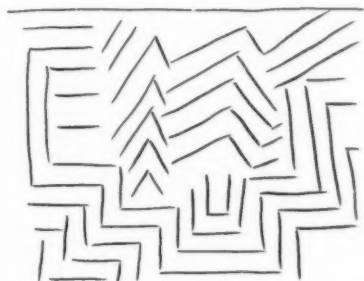
three, different vessels, and then turned the job over to the writer and awaited the result before the final discard.

Then the exciting game began. Do you recall how in the days of your youth you spent hours in putting picture puzzles together? The fascination comes again when mending a much broken piece of pottery, even when it is only a dirty old cooking pot from Long Island, guiltless of the artistic coloring which belongs to the vessels of the Southwest. You search and search for long minutes, and are about to give up in despair and declare that not another sherd will fit anywhere, when suddenly—ecstatic moment!—a piece slips into place and another section is on its way, leading to the discovery of various other small pieces which will fill in the crevices. And so one keeps on and on with almost the enthusiasm of a treasure hunter.

It did not take long to disclose the fact that most, if not all, of the sherds belonged to the same vessel. The in-

cised decoration differed on opposite sides of the rim and the thickness of the ware was very unequal, which had made it appear that two different specimens were present. Link after link was joined, until by noon of the second day a complete contact had been made around the body of what was developing into a large jar, presumably of Algonquin Indian manufacture. Only a few such pieces are in possession of the American Museum and it added zest to the adventure to know that a valuable specimen would be the outcome of our labor.

About this time Mr. Hoover, the preparator, became somewhat excited and undertook to fit in the many small pieces which might or might not compose the bottom portion of the jar. He was so successful that almost every one of the sherds found a place. It now remained only to fill the few vacant places with plaster and a fine conical vessel appeared where before had been but a heap of ugly sherds.





Photograph by B. E. Parke

PINES AND HEMLOCKS

The beautiful trees of Cook Forest, some of which were standing before William Penn conferred his name upon the forest wilderness that is now the state of Pennsylvania, deserve to be preserved, constituting, as they do, one of the few areas of primeval woodland to be found east of the Mississippi

Cook Forest

A TRACT OF PRIMEVAL WOODLAND THAT SHOULD BE
PRESERVED FOR ALL TIME

By THOMAS LIGGETT

MUCH less than a century ago, from Minnesota to Maine the northeastern United States had many millions of acres of the best forests the world has ever known. Conifers and deciduous trees of all species natural to this region flourished here and the various types of wild life—whether fin, fur, or feathers—were abundantly represented. So bountiful was the supply that our forebears and many persons still living thought that it was inexhaustible, and the waste and extravagance of which they were guilty are comparable to those of the Prodigal Son. Now we, like he, must fall back on husks.

As illustrating the waste and lack of forethought,—walnut, now worth more than mahogany, was used for such base purposes as barn floors and stalls for cattle; oak, capable of being made into the finest products, was split for fence rails; cherry and birch, now nearly approximating mahogany in value, were popular fire woods. Hemlock was cut by many millions of feet; the bark was stripped and the trees were left in the woods (sometimes two and three deep as in the "big slashing" Forest County, Pennsylvania), to rot or burn and render the soil useless for reforestation purposes for many years to come. White pine, the best of the conifers, was cut and rafted to market. From ten to twenty dollars per thousand feet, board measure, was realized for timber that would today bring in the market \$200 per thousand as pattern wood.

So great and complete has this destruction been that today a grove of the original hemlock, the most beautiful of the conifers, or a grove of the original white pine, the most stately and spectacular of these trees, is a sight that repays one for taking a journey of many miles, and wherever such groves exist, they should be preserved for the

recreation and pleasure of the coming generations.

In northwestern Pennsylvania, sixteen miles from Brookville and Clarion, both of which are on the "Lakes to Sea Highway," is what is known as "Cook Forest,"—a tract of 8200 acres on which is the largest body of old white pine conveniently located for the tourist and motorist to be found anywhere in the northeastern United States. In fact, it is the opinion of the writer that it has on it more of the old-growth white pine than is standing on all of the combined tracts of New England. In addition to the white pine there are stretches of as fine hemlock as ever grew and all of the deciduous species native to the region, including the various oaks, maples, birches, beech, cherry, ash, hickory, and walnut, as well as old cucumber trees, the fruit of which the early settlers were accustomed to put into a bottle of whiskey as a cure for all ills. Here grow also numerous wild flowers, ferns, and laurel. Wide stretches of rhododendron make of the woods great bouquets and garlands of beauty. No fire has ever occurred on the tract to mar its attractions.

On this property there are many spots that are both unusual and spectacular. It is a place not only recreational but educational. It has been well said that by keeping our people more closely in touch with nature we build a finer type of citizenship than is attained when they are surrounded uninterruptedly by the man-made environment of a city. This being true, it is the more important that spots such as Cook Forest should be preserved. Lord Ashfield, chairman of the London Underground Railway system, sees in the automobile, good roads, and opportunity through them to get out and see the beautiful in nature, some of America's greatest antidotes to



Photograph by B. E. Parke

AN ORIGINAL STAND OF HEMLOCK

Formerly hemlock was so plentiful that, according to the wasteful methods then prevailing, the bark was stripped from the trees and the denuded trunks were left to decay in the forest, or to serve as tinder in the path of some devastating fire. Today the preservation of a stand like this is a matter of far-reaching importance

Bolshevism, and if this claim be valid, how important it is that Cook Forest and similar tracts should be available for the use of the people!

A group of men, organized as the Cook Forest Association, with headquarters at 331 Fourth Avenue, Pittsburgh, and at the Franklin Trust Building, Franklin, Pennsylvania, are endeavoring to have the people, by popular contribution, raise a fund with which to buy this property from the Cook family, the members of which have thus far, both patriotically and altruistically, at much financial sacrifice to themselves, saved these trees; and then by deed of gift, with the proper regulations and restrictions embodied therein as part of the consideration, convey it to the commonwealth of Pennsylvania to be kept and preserved for the use of all the people. To have the commonwealth purchase it, is impossible. Neither the nation nor any state has thus far purchased *timber* but only cut-over land for reforestation purposes and, in any event, it is best that the state should hold it under the above-mentioned regulations and restrictions guaranteeing that these

trees shall survive.

Cook Forest will become a game sanctuary where wild life may thrive and be seen in its natural environment. On some abandoned farms scattered over the property game food could be planted in furtherance of this object. A trout stream known as Toms Run, which flows through the property for five miles, and the Clarion River, a branch of the Allegheny, which forms the frontage of Cook Forest for seven miles, offer opportunities for fresh-water life.

Excellent accommodations for the visitor are provided by Cook Forest Inn, which is the old Cook Homestead and its associated buildings, put to use by the Cook Forest Association. Already capable of accommodating about fifty people, it might in time become the nucleus of even more extensive quarters for guests.

Located as Cook Forest is within easy reach of so many millions of people—overnight from New York via the Pennsylvania Railroad, or from Chicago, by the New York Central—its preservation is a matter of interest, not only to Pennsylvania but to the whole northeastern United States.



Photograph by B. E. Parke

A section of Cook Forest along the Clarion River



Alert, yet motionless as a bronze statue

"The Sprite"

A REVIEW OF ERNEST HAROLD BAYNES' STORY OF A RED FOX¹

By G. CLYDE FISHER

ALL lovers of animals will be delighted to learn that Ernest Harold Baynes has put another of his stories into book form. Its predecessors, *Polaris, The Story of an Eskimo Dog*, and *Jimmie, The Story of a Black Bear Cub*, are splendid tales, but *The Sprite, The Story of a Red Fox* is an even more masterly production. The reason is not far to seek,—Mr. Baynes loved *The Sprite* best of all his wild animal companions, and he has given us the intimate biography of a friend, yet has avoided humanizing his subject. Without being over-sentimental, his account makes a strong appeal to our sympathy.

It begins with the babyhood of *The Sprite* and paints a wonderful picture of his life during the two years that he was a member of the Baynes'

household. The following paragraphs of the preface may be quoted for their revelation of the author's rich response to the interest and beauty of wild life:

I wish it were possible to tell you what I feel about foxes—the sensations which come when I see one in the open. I hold my breath; my clothes feel too small for me; I can hardly speak. It is much the same feeling that I should have were I suddenly to come upon a fairy. There is such beauty in his form and coloring—such grace and poetry in his motion—such mystery in his coming and his going. I have never known anyone to describe successfully the movement of a fox. Perhaps it is one of those delicate things which words will not describe. At times it might be simulated by a ball of tawny fur blown swiftly along, close to but not quite touching the ground; at others by a puff of reddish smoke, at one moment seen distinctly, then melting softly into the landscape. It is subtle as the passing of the shadow of a cloud across a field of waving grain.

¹*The Sprite, The Story of a Red Fox* by Ernest Harold Baynes. With many illustrations from photographs by Louise Birt Baynes and the author, and an Introduction by Dallas Lore Sharp. Published, 1924, by The Macmillan Company.

And think of such beauty coming into one's life in the person of a fox that loves you. It is an experience as rare as it is beautiful, and we are deeply grateful that it has been ours. If anyone else has had such an experience I have never heard of it. For nearly two years, The Sprite, a wonderful specimen of his race, as his photographs will show, was a guest in our home. Part of that time his wife and babies were also guests. Usually he came and went as he chose, and he made for himself a place not only in our hearts, but in the hearts of our neighbors.

It is with mingled feelings that I undertake to tell the story. There is joy at the thought of trying to write it, and regret in the realization that I cannot do it justice. At the very outset I am aware that I cannot convey to my readers the peculiar joy which The Sprite brought to us. But if I can make them love him, and other foxes for his sake; if the love I create is strong enough to save even a few foxes from bitter struggles and death in the steel traps—from the indignity of adorning the thoughtless, I shall have done as much perhaps as I can hope for.

The tale is a true one, and for that

reason is a valuable contribution to animal psychology, but its scientific worth is not its greatest claim to distinction, nor is the vividness of the author's language. The special fascination of the story is not scientific or literary at all, but purely human. We are told much to arouse our interest in the fox and, as is inevitable, we learn much about the story-teller, who has done so much for animals.

Mr. Baynes is a dependable naturalist who sees straight, and who writes with a "pen which not only accuracy governs but imagination inspires."

The book is illustrated with many superb photographs by the author and Mrs. Baynes, and the Introduction was written by Dallas Lore Sharp. It is a worthy addition to the literature for young readers, and grown-ups who still have the heart of youth will enjoy it no less.



Waking up with a yawn

NOTES

EXTINCT ANIMALS

MR. BARNUM BROWN, associate curator of fossil reptiles, American Museum, returned to this country on the "Aquitania," January 1, after five years spent in continuous exploration, chiefly in southern Asia, in the islands of the Mediterranean, and in Greece. He left the Museum April 16, 1919, with the immediate object of exploring the Siwalik Hills of India, as already reported in *NATURAL HISTORY*. After most successful exploration in all the levels of the great Siwalik formation, dating from the Middle Miocene to the early Pleistocene, he journeyed to Burma and reconnoitered some of the classic localities along the Irrawaddy River, first made known through the explorations of J. Crawfurd in 1826. The formations extend from Upper Eocene into Middle Miocene times and, while they are scattered and do not yield fossils superior in quality, they afford a most interesting vista of the kinship between the Upper Eocene life of Burma and that of Mongolia to the northeast, and of the Middle Miocene life of Burma as an outlier of the Middle Miocene zoölogy of India. All this exploration was conducted under the generous patronage of Mrs. Henry Clay Frick.

The fossils which have arrived from India are in superb condition and not only include a considerable number of forms new to science but also more perfectly preserved specimens of some of the known forms than have hitherto been available. These finds greatly amplify and extend our knowledge of the mammalian life of India in Tertiary times. Mrs. Frick has recently added to her previous generous gift a contribution sufficient to complete the preparation and exhibition of these superb Siwalik animals.

During his trip Mr. Brown contracted a very severe jungle fever, which threatened his life, and he was saved only through the constant and intelligent nursing of Mrs. Brown, who attended him throughout his illness.

Upon recovering, he went to the Mediterranean islands and remained especially on the island of Samos, where he procured a collection of mammalian fossils representing the Lower Pliocene period of time in the eastern Mediterranean region. He then returned to Athens, where permission to send these fossils to the American Museum was obtained,

chiefly through the aid of Mrs. Mary White Tsipouras. Afterward he journeyed to Macedonia, where he made a reconnaissance and discovered a number of fossil localities; he also worked in the caves of the island of Kalymnos. Before returning to America, Mr. Brown traveled through Europe, visiting chiefly the museums of Italy, France, Belgium, and Great Britain, and made arrangements with several of these institutions for future interchange of material.

Upon arriving at the American Museum Mr. Brown was warmly welcomed by the members of the palaeontological staff and conducted to his new office on the top floor of the Asiatic hall, facing Central Park.

In the March-April issue of *NATURAL HISTORY* will appear an account from Mr. Brown's own pen of his field experiences in India.

DR. SANTIAGO ROTH, chief of the palaeontological department of the Museo de La Plata in Argentina, died August 4, 1924. Doctor Roth was born in Switzerland but emigrated to the Argentine about fifty years ago and for some time was engaged in collecting for the Swiss museums. A fine collection of Argentine fossil mammals made by him is now in the Zurich Museum. He took an active part at that time in the discoveries of fossil human remains associated with the extinct Argentine mammals and in the controversies that raged over the problem of their antiquity. Subsequently, on the founding of the great natural history museum of La Plata, he was placed in charge of the palaeontological collections and held that position for nearly thirty years, devoting himself to the care of these collections and to field work and researches upon Argentine fossil mammals and the stratigraphy of the formations in which they are found. His studies upon the Pampean and underlying formations and upon the Notoungulata, extinct hoofed animals of South America, are his most important contributions to science. He wrote equally well in German and Spanish and the high quality of his work made him a much respected figure in South American palaeontology. The American Museum is indebted to his good offices for a valuable series of casts of South American fossil mammals received

as an exchange. Among these are the skeletons of *Macrauchenia* and *Toxodon* in the hall of the Age of Man.—W. D. MATTHEW.

FOSSIL MAMMALS FROM ST. PETERSBURG, FLORIDA.—In March, 1924, while the guest of Mr. Walter W. Holmes, of St. Petersburg, Florida, I visited the site of the old Indian village, where a great series of human skeletons, pottery, and other remains have been excavated by the Smithsonian Institution under direction of Dr. J. Walter Fewkes. Doctor Fewkes very courteously showed us the excavations and discoveries, and discussed the prospects for future archæologic research in Florida.

In this connection Mr. Holmes showed me a small plaque that he had picked up on a hunting trip in the outskirts of the city, and that had impressed him as being of a very curious and unusual pattern. I recognized it as a plate of an armored edentate, probably *Chlamytherium*, and at his suggestion we went out to look over the locality and see if other fossil remains could be discovered. We were fortunate in finding many fragments of fossil bone.

After I left for the north, Mr. Holmes continued the search at this site and at other points that seemed to be promising, and made a considerable collection, fragmentary but representing a dozen or more mammalian species, for the most part extinct, besides crocodile, turtle, fish, and even a few bird bones. His finds include:

Elephant (<i>Elephas cf. jeffersonii</i>)	fragments of teeth
Mastodon (<i>Mastodon cf. americanus</i>)	" "
Horse (<i>Equus complicatus?</i>)	teeth, vertebrae, and foot bones
Tapir (<i>Tapirus sp. indesc.?</i>)	teeth
Deer (<i>Odocoileus sp.</i>)	teeth, limb, and foot bones
Pocket gopher (<i>Geomys cf. floridanus</i>)	lower jaw
Wood rat (<i>Neotoma sp.</i>)	" "
Hare (<i>Lepus cf. floridanus</i>)	" "
Tusked deer (<i>Smilomeryx holmesii</i>)	tusk and upper molars
(new genus and species)	
Bison (<i>Bison sp.</i>)	teeth and foot bones
Raccoon (<i>Procyon sp.</i>)	teeth and parts of jaws
Opossum (<i>Didelphis sp.</i>)	parts of lower jaws
Giant armadillo (<i>Glyptodon sp.</i>)	scutes
Giant armadillo (<i>Chlamytherium sp.</i>)	scutes, part of tooth
Armadillo (<i>Dasypus sp.</i>)	scutes
Turkey (<i>Meleagris gallopavo?</i>)	part of leg bone
Alligator (<i>Alligator</i>)	limb and foot bones, vertebrae, scutes
Turtles (<i>Terrapene?</i>)	fragments of shells
Turtles (<i>Trionychid</i>)	" "

In addition to these finds, there were shark and ray teeth as well as fish spines, which still await determination.

Identified by Dr. Alexander Wetmore, to whose courtesy the American Museum is indebted for many identifications of fragmentary fossil birds.

This is a Pleistocene fauna, comparable to the fossil fauna found at Vero, west of Palm Beach, where fossil human remains were also secured. Whether these human remains from Vero were really of the same age as the fossil fauna of that locality has been questioned, and Mr. Holmes's intention is to make a very careful and critical search at the St. Petersburg site, so that if any traces of man should be found associated with its extinct fauna, the exact occurrence may be examined and fully recorded. Whether or not any human remains are discovered, it will be of advantage to know more about the extinct mammals, which include at least one of interest, a tusked deer, not hitherto found in the Pleistocene of the New World, although primitive ancestral types (*Blastomeryx*) existed in the Western Tertiary.

Mastodons and mammoths, horses and bison, tapirs, deer, opossums, and raccoons, are found in Pleistocene formations all over the country, and the last five animals still survive,¹ although the tapirs are limited to Central and South America and the bison is nearly extinct. Glyptodonts were predominantly South American, and in North America have been found only in the Southern States westward to Texas and in Mexico, while fossil remains of *Chlamydothere*s have been located only in Florida, Brazil, and Argentina. Armadillos still live in South and Central America and Mexico, and range into southern Texas. Fossil armadillos have been found in Florida but nowhere else in the United States.

The absence, in Mr. Holmes's collection, of camels, ground sloths, peccaries, and other animals listed as found at Vero may indicate that the St. Petersburg fauna is of later age geologically, or more probably is an accident due to the small number of animals thus far secured.—W. D. MATTHEW.

RUSSIAN EXPLORATION NEAR TURGAI, TURKESTAN.—Dr. Serge d'Oldenburg, perpetual secretary of the Académie des Sciences de Russie, in conveying to Prof. Henry Fairfield Osborn the diploma signaling his recent election as a corresponding member of the Academy, writes that an expedition sent out by that organization is continuing with great success excavations in the region of Turgai, where the type of the giant *Indricotherium* (close relative of *Baluchitherium*) was secured.

¹The domestic horse is, of course, an importation from the Old World and the reference by implication to the horse as one of the extinct animals applies not to this familiar beast of burden but to the fossil horses found in America.

M. Bajarunas will soon render a report of these new excavations.

Meanwhile the department of paleontology, of the American Museum, has received from the Academy a number of valuable casts of the limb and foot bones of *Indricotherium*, a rhinoceros slightly exceeding in size the type specimen of *Baluchitherium grangeri* found in Mongolia and described in a recent number of NATURAL HISTORY.¹ The American Museum is also indebted to its sister institution in Leningrad for a fine skull and many parts of the skeleton of the extremely primitive reptile known as *Pariasaurus*, from the Northern Dvina River. The Museum has sent in exchange for the *Indricotherium* casts a fine cast of the skull of *Baluchitherium* and is now negotiating with the Leningrad museum for the balance of the very ancient skeleton of *Pariasaurus*.

BIRDS

DR. ROBERT CUSHMAN MURPHY, assistant director of the American Museum, sailed on Thanksgiving Day for South America, where he is devoting three months to field work. His expedition was made possible through the generosity of the following five friends of the Museum: Mr. James B. Ford of New York, the Misses Case of Weston, Massachusetts, Mr. Charles H. Taylor of Boston, Mrs. Zechariah Chafee of Providence, and Mr. F. Gilbert Hinsdale of Mattapoisett, Massachusetts.

Doctor Murphy's first objective was the Third Pan-American Scientific Congress, which convened late in December at Lima, Peru. Mrs. Murphy, who is accompanying her husband, attended the meetings of the Second Conference of Pan-American Women, in session at the same time.

Following the meetings in Lima, it was the plan of Doctor Murphy to proceed to Ecuador to resume his ornithological and oceanographic field work from the point where he had discontinued it in 1920. The former investigations were made along some seven hundred miles of the Peruvian coast and are described in Doctor Murphy's book, *Bird Islands of Peru*, just issued by G. P. Putnam's Sons. This is a work of popular geographic character which explains the causes behind the unparalleled abundance of marine life along the coast of Peru, and describes the modern guano traffic of that country, said to be the greatest of all industries based upon the conservation of wild animals.

¹Issue for May-June, 1923, pp. 208-28.

The coast of Peru is washed by the northward-flowing Humboldt Current, which is somewhat analogous to our Gulf Stream except that it carries cold instead of warm ocean waters. At the northern end of the country, or just south of the Gulf of Guayaquil, this oceanic stream departs from the continent and flows westward across the equatorial Pacific. At this point the relatively heated tropical water of the Ecuadorean coast begins, and stretches northward toward the Bay of Panama. The temperature of the sea is so much higher than that of Peruvian latitudes that the life of these two regions is almost totally different.

Doctor Murphy and Mr. Van Campen Heilner, who was scheduled to join him in Ecuador about January 1, 1925, plan to work in small craft from the port of Guayaquil to the Colombian border, visiting each of the Ecuadorean ports, recording ocean temperatures along lines perpendicular to the shores, and gathering data on the rate and direction of the oceanic circulation. They will also make collections of the small organisms that inhabit the waters, and will study the marine fishes and fishery methods of Ecuador. Moreover, they will make a collection of sea birds and determine the northern limits of the ranges of the many species of water fowl which appear to be more or less exclusively confined to the cool waters of the Humboldt Current.

THE WHITNEY SOUTH SEA EXPEDITION.—The director of the American Museum has received a cordial letter from the Governor of the French possessions in Oceanica, thanking the Museum for a recent donation of birds to the Museum of Papeete and commending Mr. Rollo H. Beck for his conduct of the Whitney South Sea Expedition. A translation of this letter is appended:

To the Director of the
American Museum of Natural History
SIR:

In your letter of August 15 you kindly informed us that you were sending to the Museum of Papeete nineteen specimens of Polynesian birds, mounted at the museum in New York.

With the same steamer came your shipment, in excellent condition; and for it we express our full measure of gratitude.

These birds which you have presented to our museum will be placed in a special exhibition case, with a label indicating that they are the gift of the museum in New York, and that they were collected by Mr. Rollo H. Beck.

We hope some time to complete this little collection. It already includes several speci-

mens which today are very difficult to procure and our Société d'Etudes Océaniques will take great interest in receiving the publications dealing with the ornithological discoveries made in our islands by the Whitney Expedition.

In closing, we wish to assure you that we have always been highly pleased with the perfect courtesy shown by Mr. Rollo Beck during his stay among our islands.

Kindly accept, Mr. Director, this assurance of my distinguished consideration.

THE GOVERNOR OF THE
FRENCH POSSESSIONS OF OCEANICA.

ERRATUM.—In alluding to the election of Mrs. Walter W. Naumburg as a member of the American Ornithologists' Union, mention was made (*NATURAL HISTORY*, November-December, 1924, p. 722) that this distinction had been conferred previously upon only two other women. The number should have read four, Mrs. Olive Thorne Miller (deceased) and Miss Althea R. Sherman having been omitted inadvertently.

MAMMALS

NED HOLLISTER, since 1916 superintendent of the National Zoological Park at Washington, D. C., and one of the world's foremost mammalogists, died on November 3, after an operation. Mr. Hollister had experienced ill health at times during the past few years but hardly any of his friends realized that his condition was so critical. His death was an unexpected shock to all who knew him, and natural science has suffered a great loss.

Mr. Hollister was born November 26, 1876, at Delavan, Wisconsin, where he was educated and began the study of zoology, which was to become his life work. His first important zoological field work was for the Bureau of Biological Survey. From 1902 to 1909 he made investigations in Texas, New Mexico, Alaska, British Columbia, Washington, Oregon, California, Utah, Nevada, Louisiana, and Arizona. In 1910 he was appointed assistant curator of mammals in the United States National Museum, and his connection with the Smithsonian Institution lasted until his death.

Other field work included the exploration of the Mount Robson region of British Columbia and the adjoining area of Alberta in 1911, and the Altai Mountains, Siberia, and Mongolia in 1912, which he visited as a member of the Smithsonian-Harvard Expedition.

Mr. Hollister's work always received the favorable attention that is given to expressions of authoritative opinion. He was one of the

organizers of the American Society of Mammalogists and, under his guidance as editor, the *Journal of Mammalogy*, the publication of the Society, assumed an important position among publications devoted to the study of mammals. Mr. Hollister issued many papers. In addition to more than one hundred minor articles on zoological subjects, he wrote important larger works, such as "The Birds of Wisconsin" (1903); "A List of Mammals of the Philippine Islands" (1912); "Mammals of the Alpine Club Expedition to the Mount Robson Region" (1912); "East African Mammals in the U. S. National Museum" (Vol. I, 1918; Vol. II, 1919; Vol. III, 1924). Fortunately for natural science, Mr. Hollister had completed the report on the large African collections a short time before his final illness deprived the world of his services, and the last volume of the report had issued from the press before his death.

Progress and constructive activity marked Mr. Hollister's term of office at the National Zoological Park. No effort was spared to improve living conditions for the animals under his care and he brought to his work a nature which was in full sympathy with his charge. The number of visitors to the park increased steadily and reached a total of 2,400,000 for the last year. The collection of animals within the park became greater in number and in scientific interest than ever before.

Mr. Hollister belonged to many scientific societies and held many honors conferred by these societies. He was a fellow of the American Association for the Advancement of Science, a member of the Biological Society of Washington (president, 1921), of the American Ornithologists' Union, of the Washington Academy of Sciences, of the American Society of Mammalogists (editor), and of the Cosmos Club, and an honorary member of the Sociedad de Estudios Biologicos of Mexico.

Mr. Hollister's likeable personality made him many personal friends, who will mourn his untimely departure. The loss to the American Society of Mammalogists is especially great, since he occupied such an important rôle in the Society, not only as editor of the journal but as an active and moving spirit in every enterprise of the organization. Finally, the whole field of natural history regrets the passage of a man of whom so much that is good may be written and so little that one could find to criticize.—
H. E. ANTHONY.

NOTEWORTHY ADDITIONS TO THE ASIATIC MAMMAL COLLECTIONS.—The great plans of the American Museum for the appropriate exhibition of Asia's magnificent fauna in the newly erected hall have attracted wide attention. The splendid series of Indian mammals presented to the Museum by the Faunthorpe-Vernay expeditions and those of the more

than 8000 feet, offer it a natural protection. Yet some years ago even such wary game was in danger of being wiped out by reckless shooting parties. Since then the government has taken a keen interest in the preservation of the herds and as a result they have again become more numerous.

Doctor Vail, provided with letters of



Courtesy of Dr. C. E. Vail

"Pillar Rocks" near Kodai Kanal, Madurai District, India, where the Nilgiri tahr is to be found

northern region collected by the Asiatic expeditions of the Museum are gradually being rounded out.

Dr. C. E. Vail, a surgeon of the American Presbyterian Mission Hospital in southern India, when passing through New York, was inspired by President Henry Fairfield Osborn to secure a group of one of the more interesting mammals of which the Museum was still in need.

The Nilgiri tahr or, as sportsmen often call it, the "Nilgiri ibex" (*Hemitragus hylocrius*) is one of the few wild goats occurring in the tropics. It frequents the hill ranges of southwestern India, from the Western Ghats, Nilgiris, and Anamalais, practically to Cape Comorin. The picturesque, precipitous mountain fastnesses, which attain altitudes of more

introduction from the Museum, received the most cordial aid of the district forest officer, Mr. Saw, and was able to secure his quarry, but only after undergoing the severe hardships necessarily experienced in tramping about the haunts of the tahr.

Through the blackness of night he and his guides followed the edge of cliffs that seemed impassable in daytime. Often they had to hang on for dear life with both hands and both feet. Only gradually can one acquire assurance for such dangerous climbing. But even then there is the constant anxiety lest one dislodge loose stones under foot. Should a boulder suddenly slip and leap down, one may lose his hold, or, at the least, its crashing may startle the game. Yet, after laboring over the craggy walls, what a glorious

feeling to reach camp on the higher levels! One takes a few hours' rest, and wakes to see, appearing through the lifting mists and dazzling in the early sunlight, the vistas of tree tops and ranges of hills, with rolling grass country beyond.

Once a fatality was avoided by a hair's breadth. In their hurried flight the goats loosened a rock six inches in diameter. It came leaping down to the very place where but a moment before the party had been.

Through his persistence and marksmanship Doctor Vail secured four specimens. One of them, a splendid old male, has horns almost fifteen inches in length, which come close to being the best ever recorded.

The Nilgiri tahr is the only species of tahr having a short coat of rather uniform length. The tahr that lives in the mountains near Muscat, in southeastern Arabia, strangely enough, is more closely related to the Himalayan species than to that of the Nilgiris, having a harsh, shaggy coat much elongated on the nape, withers, throat, and parts of the limbs. But though much smaller in size than the Himalayan species, it has longer horns, rather less knotted, and in this respect, at least, resembles more closely the Nilgiri tahr.

Another gift from Doctor Vail is a remarkably large black Nilgiri hill monkey, *Pygathrix (Presbytiscus) johni*, the largest yet received. Doctor Vail hopes that in his spare time he may add to the Museum's Indian material some further specimens that may prove of equal value.—H. LANG.

FISH

A NEW TOP MINNOW FROM BRITISH GUIANA¹ is described by Mr. G. S. Myers in a recent number of the American Museum *Novitates*. The Pœciliidæ, or top minnows, include some rather pretty forms, prized highly by persons interested in aquaria for their ornamental and hardy qualities. Their fine health in captivity and generally long life under artificial conditions are undoubtedly due to their natural liking for quiet stretches of water. Although some of these fish occur near the shores of the sea, most of them live in brooks, or in the calm waters beneath overhanging branches along the banks of larger streams, or in the practically stagnant pools of swamps and their ditches. Fishes of

this family are of great importance in mosquito control.

The six fishes from British Guiana belonging to the new form *Rivulus mazaruni* were found as virtual captives between the rocks in one of the puddles left by the subsiding floods at Mutusi Hole, a rapid of the Mazaruni River. At this romantic spot, travel is greatly impeded, much time being lost in hauling the boats across the dangerous places. Thus, during a halt, the writer, on his way to the interior in 1922, had a chance of securing these specimens. It seems rather surprising that *Rivulus mazaruni* is apparently the first fish described from the Mazaruni River, a great western affluent of the Essequibo River, into which it flows, together with the Cuyuni, about forty miles from the mouth of the main stream.—H. LANG.

MR. JOHN T. NICHOLS, associate curator of recent fishes in the American Museum, has contributed the article on "Zoology" to *The Americana Annual*, 1924,—a digest of current events that is issued each year in continuation of *The Encyclopedia Americana*.

A MARINE COLLECTION FROM THE ARCTIC

In the summer of 1924, Captain Robert A. Bartlett accompanied the revenue cutter "Bear" on her cruise to Bering Sea and the adjacent Arctic Ocean, his purpose being to secure scientific data which would be of interest in connection with the further exploration of far northern waters. Whenever opportunity offered, he used a dredge, and by its means made a collection which he has since presented to the American Museum. The specimens are mostly invertebrates, especially crustaceans, mollusks, ascidians, and the like. Many of these are new to the collection of the Museum, which has had comparatively little material from the region. After a preliminary sorting it was found that the collection of invertebrates comprises 375 lots, each lot containing from one or two to many specimens each. Several species of fishes were also included,—sculpins, the snake blenny (*Lumpenus*), spotted kelp blenny (*Stichæus*), *Aspidophoroides guntheri*, eel pouts, post-larval gadoids, etc. Dr. F. Johansen of Ottawa, at present engaged in a revision of the fishes of the Arctic Ocean, found this material of much interest when visiting the Museum recently.

¹"A New Pœciliid Fish of the Genus *Rivulus* from British Guiana." *Novitates*, Amer. Mus. Nat. Hist., No. 129, 1924, pp. 1-2.

EDMUND OTIS HOVEY

A signal tribute has been paid to the memory of Dr. Edmund Otis Hovey, late curator of geology and invertebrate palaeontology, American Museum, in the adoption of the following Resolution, an attractively printed copy of which was presented to the American Museum. It will be appropriately framed and permanently placed in the office of the curator of the department of geology

THE DEATH OF EDMUND OTIS HOVEY HAVING BEEN ANNOUNCED AT THE MONTHLY MEETING OF THE BOARD OF TRUSTEES OF FIELD MUSEUM OF NATURAL HISTORY, HELD OCTOBER 20, 1924, THE FOLLOWING RESOLUTION WAS ADOPTED AS A TESTIMONIAL OF HIS SERVICES TO SCIENCE AND MUSEUM PRACTICE.

THE BOARD OF TRUSTEES OF FIELD MUSEUM OF NATURAL HISTORY HAVE LEARNED WITH DEEP REGRET OF THE DEATH OF DOCTOR EDMUND OTIS HOVEY, FOR MANY YEARS CURATOR OF GEOLOGY OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

DURING A LIFETIME DEVOTED TO MUSEUM SERVICE, DOCTOR HOVEY DISPLAYED TO A REMARKABLE DEGREE COMBINED QUALITIES OF A MASTER AND OF AN INTERPRETER OF SCIENCE. NOT ONLY WERE HIS CONTRIBUTIONS TO SCIENTIFIC KNOWLEDGE MARKED AND VALUABLE BUT HE WAS EQUALLY CAPABLE IN MAKING THEM OF PUBLIC INTEREST. HIS WORK OF MUSEUM INSTALLATION, TOO, WAS CHARACTERIZED BY ORIGINALITY AND EFFECTIVENESS. HE WAS A LEADER IN DEVISING NEW METHODS OF MUSEUM DISPLAY AND A PIONEER IN SUPPLEMENTING SYSTEMATIC COLLECTIONS WITH EFFECTIVE GROUPS. HE WAS ALSO A PLEASING AND AUTHORITATIVE WRITER AND AN ENTERTAINING AND INSTRUCTIVE LECTURER. IN HIS OCCASIONAL VISITS TO FIELD MUSEUM, DOCTOR HOVEY WAS ALWAYS READY FOR THE EXCHANGE OF IDEAS, BEING FREE TO GIVE OR RECEIVE WHATEVER VIEWS HE BELIEVED MIGHT ADVANCE THE CAUSE OF MUSEUM REPRESENTATION OR AID IN THE GENERAL DIFFUSION OF KNOWLEDGE.

TO OUR SISTER INSTITUTION AND DOCTOR HOVEY'S BEREAVED FAMILY, THE BOARD OF TRUSTEES EXTEND THEIR SINCERE SYMPATHY AND HAVE ORDERED A COPY OF THESE RESOLUTIONS SPREAD UPON THE RECORDS OF THIS INSTITUTION.

STANLEY FIELD,
PRESIDENT

D. C. DAVIES
SECRETARY AND DIRECTOR

EUROPEAN ARCHÆOLOGY

EOLITHIC ORNAMENT AND ART.—An extensive review of Hugo Obermaier's *Fossil Man in Spain* was published in the issue of NATURAL HISTORY for November–December, 1924, and, in view of this fact, Mr. J. Reid Moir, who contributed the leading article to the same issue, has asked that the following letter be printed in the magazine:

To the Editor of
NATURAL HISTORY,
Sir,—

In the English translation, just published, of Prof. Hugo Obermaier's book *Fossil Man in Spain* (Yale University Press for Hispanic Society of America), I notice that, on page 9, the following statement appears—"But some among them—Boucher de Perthes, Dharvent, Newton, Thieullen, and J. R. Moir—went further, and proclaimed the existence of Eolithic ornament and art."

This, so far as I am concerned, is entirely incorrect. I have never "proclaimed" a belief in the existence, in any form, of Eolithic

ornament and art, nor do I consider that evidence which would make such a belief inevitable has, at present, been discovered.

In view of the fact that, in all probability, Professor Obermaier's book will be widely read in America, I think it to be necessary to make the above correction.

Yours faithfully,
J. REID MOIR

"Tertiary Man in England."—In the Note on J. Reid Moir's "Tertiary Man in England" contributed by Sir E. Ray Lankester to the issue of NATURAL HISTORY for November–December, 1924, there is a typographical error that gives a different significance to one of the statements from that which the author had intended. The sentence, which finds place on p. 654, should read:

This latter had a molluscan fauna, in many respects identical with that of the deposits distinguished by the name "Pliocene."

As originally printed the word "marine" was substituted for "name."

RECENT GATHERINGS AND EVENTS

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE held its seventyninth meeting at Washington, D. C., from December 29, 1924, to January 3, 1925. As usual a number of valuable papers—the result of research in many different branches of science—were presented; those contributed by members of the American Museum staff included the following:

"The Significance of Insect Sounds" by Dr. Frank E. Lutz; "The 'Retrograde Metamorphosis' of the Sirenidae; Experiments on the Functional Activity of the Thyroid of the Perennibranchs" and "The Integumentary, Pulmonary, and Cardiac Modifications Correlated with Increased Cutaneous Respiration in the Amphibia" by Dr. G. K. Noble; "The Classified Continuation Card Catalog of *The Bibliography of Fishes*" and "The Distribution of the Oilfish, *Ruvettus pretiosus*, in the Pacific Ocean, as Shown by the Peculiar Hook Used in Its Capture" by Dr. E. W. Gudger; and "Pottery of Northeastern Asia and Northwestern America" by Dr. Waldemar Jochelson.

To the great regret of those attending, Prof. Henry Fairfield Osborn was unable to deliver his announced address on "Factors in the Evolution and Phylogeny of the Proboscidea."

Dr. Frank E. Lutz and Dr. Clarke Wissler were the official representatives of the American Museum at the gathering, and Doctor Wissler attended also the two-day conference

of the National Research Council on problems in human migration, at which he had an opportunity of presenting the results of the investigation he has been making, in association with Dr. Louis R. Sullivan and Dr. Milo Hellman, into the question of race crossing and heredity.

DR. FRANK M. CHAPMAN represented the American Museum at the Conference on Outdoor Recreation, which was held in Washington on December 11 and 12.

DR. CHARLES D. WALCOTT, secretary of the Smithsonian Institution, represented the American Museum at the annual reception and exhibit of the current work of the Carnegie Institution of Washington, held on the evening of December 11.

THE YOSEMITE MUSEUM.—The cornerstone of the Yosemite Museum,¹ in Yosemite National Park, was laid on November 16, 1924, and on the same day the new administration building was dedicated.

NEW MEMBERS

Since the last issue of NATURAL HISTORY the following persons have been elected members of the American Museum, making the total membership 8039:

Associate Benefactor: GEO. F. BAKER, JR.

Patrons: MESDAMES CHILDS FRICK AND WILLIAM L. HARKNESS; MESSRS. AUSTEN COLGATE, HOWARD FUGUET, AND CLARENCE L. HAY.

Honorary Fellow: PROF. WILLIAM M. DAVIS.

Fellows: MRS. ARTHUR RYERSON; MISS ANNIE M. ALEXANDER; MESSRS. H. W. DE FOREST, DESMOND FITZGERALD, THOMAS S. GATES, CLARENCE H. MACKAY, GILBERT S. MCCLINTOCK, ROSWELL MILLER, ARTHUR NEWBOLD, AND WILLIAM WILLIAMS.

Life Members: MESDAMES DANIEL BECKWITH, JONATHAN BULKLEY, Z. CHAFEE, CHARLES MERRILL CHAPIN, JOHN HILLS, CHRISTIAN R. HOLMES, GEORGE KENNAN, F. J. SARMIENTO, J. E. SPINGARN, W. V. S. THORNE, AND CASPAR WHITNEY; DOCTORS WM. S. BIGELOW, WILLIAM E. KEITH, AND C. E. VAIL; HON. JAMES G. CUTLER, HON. JOHN W. GARRETT, AND HON. IRA M. MORRIS; MESSRS. JAMES S. ALEXANDER, GEORGE B. ALVORD, JOHN EDWARDS BARBOUR, HARRY PAYNE BINGHAM, JAMES D. BLACK, JAMES L.

BLACKMER, J. L. BRADLEY, ROBERT M. CATTS, PERCY CHUBB, HENRY A. COLGATE, Z. MARSHALL CRANE, JAMES W. CROMWELL, WILLIAM H. CROSBY, GHERARDI DAVIS, ALVAH DAVISON, CLEVELAND E. DODGE, H. YALE DOLAN, F. L. DUNBAR, GEORGE EHRET, JR., R. I. FARRINGTON, T. R. FELL, EDWIN A. FISHER, RADCLIFFE FURNESS, WILLIAM GAMMELL, HARRY W. GODDARD, E. ROLAND HARRIMAN, F. GILBERT HINSDALE, ANTON G. HODENPYL, ARTHUR HOFHEIMER, CLEMENT S. HOUGHTON, HORATIO G. LLOYD, HOMER W. ORVIS, OWEN SHOEMAKER PAXSON, MAX L. ROSENBERG, J. CLINTON SPENCER, EDWARD DAVID WOODBERRY SPINGARN, FREDERICK STRAUSS, CHARLES H. TAYLOR, J. KENNEDY TOD, AND CASPAR WHITNEY.

Sustaining Members: MESDAMES W. B. BOUTON AND THOMAS UPHAM COE; MISS CLARA L. CRANE; DR. WALTER J. OTIS; MESSRS. EBEN S. DRAPER, EDWARD EPSTEIN, OSCAR I. MAYER, HENRY B. NEWHALL, F. F. PRENTISS, EDWIN SEFTON, AND R. L. SLEETH, JR.

Annual Members: MESDAMES J. STEWART BARNEY, ANNIE M. BELL, C. C. CARPENTER, JUAN M. CEBALLOS, GRENVILLE CLARK, W. MURRAY CRANE, FRANK CROCKER, FRANK A. DUDLEY, FRANK H. ERISMAN, E. DE PEYSTER HOSMER, GEORGE PRESTON HOTALING, ALBERT A. LEVI, ROBERT H. McNALL, THOMAS S. MAXEY, EDWARD T. NICHOLS, ROBERT L. PADDOCK, F. PILAT WILLIAM RAYMOND, AND EDW. C. SCHAEFER; MISSES MARIE THEMESSE BERGE, CAROLINE BIJUR, EMILY DELAFIELD, HARRIET N. DEVOTION, JANE G. FRASER, FRANCES MOULTON, MARION SMITH, MARIE WAGNER, AND MIRIAM DWIGHT WALKER; MAJOR GENERAL WILLIAM CROZIER, GENERAL AVERY D. ANDREWS; DOCTORS HENRY G. BUGBEE, R. CONSTANTIAN, BURDETTE P. CRAIG, ALFRED N. GOLDSMITH, AND HERMAN JARECKY; THE REV. JOSEPH ASSMUTH; BROTHER C. BASIL; MESSRS. W. F. ADAM, H. ALBAN ANDERSON, AUGUST C. ANGER, JR., PAUL ARNOLD, S. BENJAMIN ARNOLD, BENTON BAKER, ARTHUR A. BALLANTINE, SUMNER BALLARD, WALTER E. BELL, SAMUEL T. BODINE, ALEXANDER F. BRAND, WALTER B. BROOKS, WM. H. BROWNING, WILLIAM H. CALKINS, WILLIAM B. CHARLES, F. EDWIN CHURCH, WALTER H. CLUETT, OSCAR L. COLES, ALBERT E. COLBURN, C. E. COTTING, JOHN H. COWLES, J. BARLOW CULLUM, LEWIS L. DELAFIELD, JR., WILLIAM K. DICK, E. A. DUNLOP, F. A. EMERICK, HERMAN FELDMAN, HARRY G. FLETCHER, JAMES B. A. FOSBURGH,

¹For a more detailed Note regarding this projected museum the reader is referred to the issue of NATURAL HISTORY for September-October, 1924, p. 621.

WILLIAM ERIC FOWLER, ERNEST T. FRANCK, AMOS TUCK FRENCH, E. R. GRANT, HARRY K. GRIGG, J. W. GUTMAN, HOWARD S. HART, FREDERICK ROWLAND HAZARD, W. W. HOFFMAN, T. C. HOLLANDER, MAURICE HOOPES, NORMAN S. HOPE, EDWIN C. HYMAN, ROBERT HATFIELD IRONS, GEORGE B. JOHNSON, MAX S. KALLMAN, GEORGE L. KUMPF, S. FORRY LAUCKS, HENRY D. LINDSLEY, SOLOMON LOWENSTEIN, CHARLES MARX, ROBERT W. MAYNARD, JULES NEHRING, HAZARD OKEY, SCHUYLER L. PARSONS, H. GALLATIN PELL, TIMOTHY NEWELL PFEIFFER, WM. PAUL PICKHARDT, FREDERICK PUTNAM PLATT, THEODORE ROSENWALD, CLINTON L. ROSSITER, H. S. ROWLEY, EDWARD WHEELLOCK RUNYON, LIONEL SCHUSTER, W. C. SPRUANCE, REGINALD H. STURGIS, SPENCER TURNER, D. D. VAN MATER, ERNEST ALAN VAN VLECK, GILBERT C. WOOD; MASTER ROBERT BENDHEIM, MASTER NORTON SKINNER; HARLEM ACADEMY.

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THE MARCH-APRIL ISSUE

In the next number of *Natural History*, the reader, instead of having his interest concentrated on a single continent, will be given an opportunity to range over a wider field, making acquaintance with interesting phenomena the world over. Mr. Barnum Brown, leader of the Siwalik Hills Indian Expedition of the American Museum, will tell of his experiences in collecting fossils under the burning sun of the Orient. Dr. E. W. Gudger will contribute an article on "Cats As Fishermen," dispelling the illusion that all Toms and Tabbies are afraid of the water. There will be an article by Mr. Herbert P. Whitlock on "Mimicry of Minerals" and one by Dr. Robert H. Lowie on "A Women's Ceremony among the Hopi." Prof. William T. Shaw will present some of his field observations of the hoary marmot and Mr. Frank Levy will tell how he trained a falcon. The reader will be made acquainted with two-headed snakes through an article by Mr. B. T. B. Hyde. The value of paleontology will be emphasized by Dr. William D. Matthew. Through an article by Dr. F. E. Lutz a better conception will be had of the significance of some of the insect groups recently installed in the American Museum.